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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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CONTENTS

Volume 10 February 1977 No. 2

Page

General 53
(News items, letters, and editorials appearing in scientific and technical journals; information on production and use; and other items of general interest)

Monitoring and Residues 55
(Levels of pesticides in people or nonexperimental animals or in water, air, soil, food, feed, and other consumer products)

Epidemiology, Prevention and Treatment 67
(Frequency and distribution of pesticide poisoning in man or nonexperimental animals and treatment of clinical cases; morbidity and mortality; safety measures; decontamination; disposal of containers and wastes; legislation and regulations)

Toxicology and Pharmacology 73
(Toxicity studies in man and animals; effects on cells; organs, and systems; metabolic studies, biochemistry, interactions; antidotes and other treatment; mode of action. Ordinarily, articles dealing with efficacy studies are not included.)

Analysis 96
(Preparation of samples; analytical methods; instrumentation)

77-0233. Truffert, L. (Serv. Lab. Cent., Prefect. Police, Paris, France). **Les dangers de la pollution cadmique de l'environnement. [Dangers of cadmium pollution of the environment.]** *Ann. Falsif. Expert. Chim.* 69(741): 465-472; 1976. (26 references) (French)

Cadmium is emitted into the environment from many sources; it accompanies zinc in metallurgical processes. According to a study performed in the USA in 1968, of the approximately 200 tons of cadmium released into the atmosphere in the USA per year, 0.2 tons originate from fungicides. Average daily intake levels of cadmium vary in different countries and regions but generally fall at about 50 μg/day. In addition to the acute illness caused by cadmium pollution of a river in Japan, a variety of harmful effects of cadmium ingestion have been noted in experimental animals and in workers exposed to excessive levels.

77-0234. Donaubauer, E. (Inst. Forstsch., Forstl. Bundesversuchsanst., Vienna, Austria). **Ueber die Verwendung von Bakterien und Viren zur Bekampfung einiger Forstschaedlinge. [The use of bacteria and viruses for controlling some forest pests.]** *Allg. Forstz.* 87(4): 112-114; 1976. (9 references) (German)

Although a great variety of fungi, bacteria, viruses, and protozoa have been tested for insect control, only a few have attained commercial utility. The two preparations now used on an appreciable scale in forestry are *Bacillus thuringiensis* and the polyhedral virus of *Neodiprion sertifer*. *Bacillus thuringiensis* was successfully employed against several moth species in Austria. The bacterial suspension was applied by aircraft or tractor sprayer. Good results against the target organisms were achieved, and parasitic and other nontarget species were not harmed. A high rate of success was also attained with polyhedral virus on infested pine stands. Early spraying is important in this case, in view of the incubation period of 12-16 days. The virus remains viable in suspension for at least seven years. Viral preparations are not yet commercially available in Austria, but the Federal Institute for Forest Protection has a supply which can be used in case of catastrophic infestations. An additional advantage of the use of viruses is the possibility of carryover, eliminating the need for retreatment.

77-0235. Gawecki, J.; Urbanowicz, M.; Buchowski, M.; Borowicz, T. (Chair Hum. Nutr. Technol. Hyg., Univ. Agric., Poznan, Poland). **The effect of poisoning with dithane M-45 on oxygen uptake and energy balance in adult rats.** *Acta Physiol. Pol.* 27(2): 169-174; 1976. (19 references)

Female Wistar rats weighing ca. 200 g were fed standard diet containing Dithane M-45 at 5-5000 ppm (active ingredient: 80% zineb plus maneb). The oxygen uptake (VO_2), metabolic rate, and energy balance were determined at intervals of several days. No significant change was recorded in oxygen uptake and metabolic rate of animals receiving Dithane M-45 at 5-50 ppm, but these values were significantly decreased in animals fed diet containing 500, 2000, or 5000 ppm. The changes in body weight of animals treated with Dithane M-45 were said to be due to both reduced feed intake and reduced energy utilization.

77-0236. Anonymous. **Programme advocated to measure impact of agricultural pesticides.** *Agric. Environ.* 2(2): 195-1096; 1975.

A group of experts convened by the United Nations Environment Program and the Food and Agriculture Organization agreed on a worldwide program to measure the impact of agricultural pesticide residues on the environment. The development of such a program was suggested at the 1972 Stockholm Conference on the Human Environment. The experts agreed that missions should be sent to identify specific environmental problems in locations of intensive pesticide use, specific ecological vulnerability, or where new and potentially hazardous uses of pesticides are planned. A formal advisory panel would be established. Another component of the monitoring program was recommended to comprise research on persistence of pesticides in tropical ecosystems and the relationship between soil contamination by pesticides and plant productivity.

77-0237. Van Coallie, R.; Sasseville, J. L.; Visser, S. A. (INTR-EAU, Univ. Quebec, Ste.-Foy, Quebec, C1V 4C7). **Cheminement du mercure et des insecticides vers les organismes aquatiques. [Circulation of mercury and insecticides in aquatic organisms.]** *Eau Quebec* 9(4): 35-39; 1976. (31 references) (French)

Pollution of inland waters by mercury and insecticides has been demonstrated in numerous studies. The course of mercury contamination may be followed from various sources, including natural deposits and industrial processes as well as agrochemical use, to land and water organisms and to the atmosphere. The sources of insecticides are more limited, but they too are released into the environment and become widely distributed. They may persist for only days to more than decades, depending on their chemical composition. Quantities used and distribution studies are reviewed.

77-0238. Ember, L. (Author address not given). **Environmental cancers: humans as the experimental model?** *Environ. Sci. Technol.* 10(13): 1190-1195; 1976.

With the current recognition that most human cancers are caused by environmental factors emphasis in cancer research is shifting from a search for the causes of cancer to a search for methods of predicting and preventing its occurrence. Tests are being developed to assess the carcinogenic potentials of contaminants, including pesticides, and to define the acceptable levels of risks. The problem of cocarcinogenic effects is particularly troublesome. The basic principle of the Delaney amendment, that

demonstration of carcinogenesis in any species implies a hazard to man, is becoming accepted. Carcinogenesis may first become apparent in workers heavily exposed to a substance, thus making the worker a sort of test animal. The dioxin catastrophe at Seveso has served as a dramatic example of the spread of an industrial pollutant from a localized source, as has the incident involving Kepone (chlordecone) emission into the James river.

77-0239. Anonymous. **Allied has hard time disposing of Kepone.** *Chem. Eng. News* 54(49): 6; 1976.

Disposal of Kepone (chlordecone) and materials contaminated with it continues to present problems. An application to bury kepone-contaminated materials in an abandoned missile silo was rejected, and the question of dredging the James river is yet unresolved. Contaminated materials include sludge at the Hopewell, Va. treatment plant, contaminated soil around the plant where Kepone was produced, and 85,000 lb of unused Kepone stored in scrap metal. Test burns have been scheduled in a high-temperature incinerator, but the tests have been postponed. A further problem is presented by 5000 lb of Kepone contaminated with arsenic, which would be released into the atmosphere if burned.

77-0240. Skatulla, U. (Inst. Angew. Zool., Munich, Germany). **Einsatz einer Virose gegen den Heidelbeerspanner, *Boarmia bistortata* (Goeze) im Freiland.** [**Use of a virus disease for control of *Boarmia bistortata* in the field.**] *Anz. Schaedlingsk. Pflanzensch. Umweltsch.* 48(12): 179-181; 1975. (1 reference) (German)

Very few cases of virus diseases in Geometridae have been reported to date. A single virus-infected larva was found during an outbreak of *Boarmia bistortata* near Weiden, Northern Bavaria, in 1974. The virus was reared in 16,000 *Boarmia* fed an artificial diet in 1974-75, then used for biological control of the pest in the field in the spring of 1975. Complete (100%) mortality of the pest population was recorded within 13 days after application. The virus was specific for *Boarmia bistortata*.

77-0241. Piedrola-Gil, G. (R. Acad. Nac. Med., Madrid, Spain). **Exitos y problemas ecologic-sanitarios de los plaguicidas.** [**Successes and ecological-sanitary problems of pesticides.**] *An. R. Acad. Nac. Med.* 93(2): 267-303; 1976. (37 references) (Spanish)

The necessity for pesticide use in certain cases is undisputable. Pesticides have played a major role in the control of malaria, typhus, cholera, relapsing fever, trypanosomiasis, leishmaniasis, and other arthropod-borne diseases. On the other hand they have been responsible for accidental, occupational, and intentional poisonings in humans and animals, harmful effects on the environment, acquired resistance, and residual effects such as carcinogenesis and mutagenesis. Laws governing pesticides have been passed in Spain, beginning with the creation of the Phytopathology and Agricultural Pests Service within the Ministry of Agriculture in 1940, and including most recently the restrictions imposed on the use of pesticides which persist in the environment passed in 1975.

77-0242. Wegner, Z.; Kruminis-Lozowska, W. (Inst. Mar. Trop. Med., Gdynia, Poland). **Laboratory research into the utilization of the common castor-oil plant *(Ricinus communis L.)* in the control of rats.** *Biul. Inst. Med. Morskiej* 27(2): 229-240; 1976. (15 references)

The rodenticidal efficacy and practical utility of the toxic protein from the seeds of the castor oil plant were examined. The protein was obtained from the seeds after castor oil production by extraction with 0.9% sodium chloride followed by ammonium sulfate fractionation. The fraction precipitated with 30-45% ammonium sulfate was particularly toxic to rats when administered intragastrically. When the protein was incorporated into the diet it made the diet unpalatable to rats, and therefore they consumed only small amounts of poisoned feed. Rats which consumed small quantities of the protein for several days developed resistance to its toxic effects.

77-0243. Skierska, B.; Szadziewska, M. (Inst. Mar. Trop. Med., Gdynia, Poland). **Laboratory tests for usability of the entomophilic nematodes *Steinernematidae* Chitwood et Chitwood 1937 in biological control of some noxious arhropods.** *Biul. Inst. Med. Morskiej* 27(2): 207-227; 1976. (23 references)

Laboratory tests were performed to assess the usefulness of the entomophilic nematodes *Neoplectana* DD 136 for biological control of the heteropterans *Triatoma infestans* Klug and *Rhodnius prolixus* Stal., vectors of Chagaes disease. However, selection of a suitable dissemination mode for the parasites is difficult, since they prefer moist terrestrial habitats. The nematodes are not capable of colonizing bodies of water, and the costs of rearing an adequate number of infective nematodes in the laboratory are too high for practical utility.

77-0244. Li, Y. H. (Geol. Observ., Columbia Univ., Palisades, NY 10964). **Population growth and environmental problems in Taiwan (Formosa): a case study.** *Environ. Conserv.* 3(3): 171-177; 1976. (17 references)

Taiwan Island is slightly smaller than Holland and has only limited natural resources, yet maintains a high density population at a moderate living standard. Rapid industrialization has taken place during the past 10-15 years. Rainfall is generally adequate and the subtropical climical permits the harvesting of 2-3 crops per year with adequate fertilization. The application rate of pesticides has increased exponentially since 1950. Rice paddy soil is already heavily contaminated with chlorinated hydrocarbons and heavy metals. Foods which cannot be exported due to excessive contamination are still consumed in Taiwan, since no restrictions have yet been imposed on the mercury or arsenic contents of foods in Taiwan. Air pollution, water pollution, and soil erosion pose serious problems due to increasing industralization, and the high levels of importation of energy and supplemetary foods pose a threat for the future.

77-0245. Hapke, H. J. (Inst. Pharmacol. Toxicool. Pharm., Tieraerztl. Hochsch., Hanover, Germany). **Immissionswirkungen auf Tiere.** [**Effects of pollutants on animals.**] *Forum Umwelthyg.* 27(2): 187-190; 1976. (German)

Pesticides are among the environmental pollutants which may affect the health of domestic animals and their suitability for various purposes, e.g., for use as food for humans. They fall into the class of uncontrollable pollutants (along with industrial contamination), since they are inevitably present in the feed and water supplied to the animals in many cases. The preventive measures which must be implemented to ensure human and animal health include establishment of residue limits and testing programs.

77-0246. Muir, C. S. (Unit Epidemiol. Biostatistics, Internat. Ag. Res. Cancer, World Health Org., Lyon, France). **The programs of the International Agency for Research on Cancer (IARC) in Asia.** *Gann Monogr. Cancer Res.* 18: 303-314; 1976. (19 references)

Most of the IARC programs in Asia, as elsewhere, are concentrated in the areas of applied epidemiology and environmental biology. The agency has developed contacts with cancer registries and promoted the development of such registries in areas with cancer patterns of unusual interest. Digestive tract cancer is a major problem in Asia; agency studies in Asia have concentrated on the esophagus and liver. Respiratory tract cancer is also significant in Asia. Etiologic patterns are examined in areas where such trends are identified. One of the environmental factors examined in these studies is pesticide use; the Agency has supported international studies on the carcinogenicity of DDT.

77-0247. Koivurinta, J.; Koivistoinen, P. (Inst. Food Chem. Technol., Univ. Helsinki, Finland). **Trichlorfon residues in lettuce.** *Acta Agric. Scand.* 25(4): 346-347; 1975. (1 reference)

The disappearance of trichlorfon residues on leaf and head lettuce was studied at the experimental fields of the University of Helsinki. A 0.15% spray of commercial formula Dipterex was applied at the time of head formation in head lettuce and as the leaf lettuce was just beginning to be harvestable. Initial residue levels of 26-34 ppm were determined when trichlorfon was applied at a rate of 1.2 k6 a.i./ha. The half-life was approximately one day in all experiments; average temperature during the first study period was 19.6°C and total rainfall was 71 mm, while average temperature during the second study was 16°C and average rainfall was 133 mm. Residues disappeared somewhat more rapidly from head lettuce than leaf lettuce. All residues declined to or below 0.05 ppm in 21 days. The differences in temperature and rainfall between the experiments performed in mid-July and early August did not significantly affect the results.

77-0248. Bakken, A. F.; Seip, M. (Dep. Pediatrics, Rikshospitalet, Univ. Oslo, Oslo, Norway). **Insecticides in human breast milk.** *Acta Paediatr. Scand.* 65(5): 535-539; 1976. (20 references)

DDT, BHC, BHC isomers, dieldrin, aldrin, and heptachlor epoxide were determined by gas chromatography in 50 samples of human breast milk. All samples contained DDT, BHC, and HCB in quantities from traces to 11 times above the WHO recommended maximum for cow's milk. The other substances were less frequently encountered, but were present at fairly high levels in isolated cases. No change was apparent in DDT concentration in human breast milk in comparison to a study performed just after official prohibition of DDT use in 1970. The insecticide content of the milk decreased with increasing duration of lactation. Considerable variations in insecticide levels were found in samples collected from the same woman a few days apart.

77-0249. Hattula, M. L.; Ikkala, J.; Isomaki, M.; Maatta, K.; Arstila, A. U. (Dep. Chem., Univ. Jyvaskyla, Jyvaskyla, Finland). **Chlorinated hydrocarbon residues (PCB and DDT) in human liver, adipose tissue and brain in Finland.** *Acta Pharmacol. Toxicol.* 39(5): 545-554; 1976. (14 references)

PCB and DDT residues were examined in autopsy samples from 41 persons residing near Pori on the Gulf of Bothnia in Finland and 32 persons residing near Jyvaskyla in central Finland. Ages of the deceased were 0-82 years. Results for the overall group were as follows: PCB in liver 0.15 ppm, total DDT 0.22 ppm, PCB in adipose tissue 1.97 ppm, total DDT 2.50 ppm, and PCB in brain 0.12 ppm and total DDT 0.10 ppm. PCB was present in almost all of the samples analyzed; other chlorinated hydrocarbons identified were lindane, DDT and its metabolites, DDE, and DDD. Aldrin, dieldrin, endrin and *o,p'*-DDT were not detected. There were no statistically significant differences in concentrations of PCB and DDT in individuals of different age groups or sex in the present experimental material, nor did the residues vary corresponding to geographic location. A slightly higher average PCB level in adipose tissue was found for Pori than for Jyvaskyla, and was especially marked in the higher age group. Occupations and causes of death in patients with high organochlorine levels were discussed.

77-0250. Leistra, M. (Lab. Res. Insecticides, Wageningen, The Netherlands). **Computed leaching of pesticides from soil as influenced by high rainfall, plant growth and time of application.** *Agric. Environ.* 2(2): 137-146; 1975. (6 references)

The resk of leaching trom the top meter of soil was evaluated in a series of computations for hypothetical pesticides. Decomposition rates and sorption strengths were introduced into the models in various combinations. The predicted amounts that would be leached under specific field conditions were compared with losses computed in case of spring applications to a field where a simulated potato crop was grown. An increase in the computed leaching of compounds which demonstrated some leaching under standard rainfall conditions was the principal effect of high rainfall in the year after spring application. The risk of leaching was considerably increased in the absence of water and pesticide uptake by a crop. The predicted amounts of leaching for autumn application were substantially greater than with spring applications.

77-0251. Smelt, J. H.; Tuinstra, L. G. M. T.; Maenhout, C. A. A. A.; Luten, W. (Lab. Res. Insecticides, Wageningen, The Netherlands). **Uptake of DDT and related compounds from soils into forage crops.** *Agro-Ecosystems* 2(2): 133-143; 1975. (13 references)

Field trials on uptake of DDT and related compounds (DDTR) were performed on loamy soils that had previously been used for fruit trees. The test plants were alfalfa, maize, sugarbeet, mangold, potato, and ryegrass, and the DDTR was comprised of *p,p'*-DDT, *p,p'*-DDE, *p,p'*-TDE, and *o,p'*-DDT. The residues had accumulated in the soil due to repeated application of DDT for 20 yr; DDTR levels in the soil ranged from 0.7 to 2.5 mg/kg (dry weight). The value of the ratio of DDTR content in the crop to DDTR content in the soil (dry weight) was below 0.03 for foddered alfalfa and maize plants and for sugarbeets and mangolds. The highest values were found for potatoes with an average ratio of 0.09 for all sizes. The DDTR residues in the tubers were primarily located in the skins, as residues in peeled potatoes were below the limits of determination. The ratio value for ryegrass in the first three cuts after sowing was less than 0.05. An average value of 0.0044 ppm *p,p'*-DDE was found for grass mown during a whole season on a permanent pasture. Uptake factors for the four compounds studied were basically similar. Contamination of the crop with soil during harvesting can greatly increase the residue values.

77-0252. Smelt, J. H.; Wieringa, G. W.; Tuinstra, L. G. M. T.; Luten, W.; Maenhout, C. A. A. A. (Lab. Res. Insecticides, Wageningen, The Netherlands). **Effects of ensilage methods and field drying on residues of DDT in grass and alfalfa.** *Agro-Ecosystems* 2(2): 145-151; 1975. (5 references)

The dynamics of residues of *p,p'*-DDT, *p,p'*-TDE, *p,p'*-DDE, and *o,p'*-DDT were examined in the laboratory on ensiled grass placed in containers with volumes of 1 dm^3. No significant decrease in the levels of the compounds examined was found after 60-day storage periods at 20 and 35°C. Thus ensilage with the desired fermentative processes does not seem to be a suitable method for reducing DDT residues in pasture grass. Similar negative results were obtained in a hay drying experiment: grass and alfalfa contaminated with low levels of DDT and its analogs by uptake from soil and traces of spray drift were field-dried to hay. No significant change occurred in levels of *p,p'*-DDT, *p,p'*-DDE, *p,p'*-TDE, and *o,p'*-DDT.

77-0253. Jain, P. C.; Gupta, H. L. (Dep. Entomol., Univ. Udaipur, Udapiur, India). **Persistence of lindane, malathion and parathion residues in brinjal fruits.** *Ann. Arid Zone* 15 (1/2): 37-42; 1976. (12 references)

Changes in residue levels were determined following field treatment of brinjal (Solanum melongena L.) with 0.01% malathion, or 0.042% parathion solutions at the rate of 350 l/ha. Residues were determined by a bioassay method using *Drosophila melanogaster*. The initial deposits were 10-11 ppm lindane, 17-18 ppm malathion, and 20-21 ppm parathion. Residues of lindane, malathion, and parathion dropped below the tolerance limits of 10, 8, and 1 ppm within 1, 3, and 10 days after treatment respectively. The half-life values for lindane, malathion, and parathion on brinjal fruits were 5, 2-3, and 3-4 days respectively.

77-0254. Hilton, H. W.; Nomura, N. S.; Kameda, S. S.; Yauger, W. L. (Exper Stn., Hawaiian Sugar Planters Assoc., Honolulu, HI 96822). **Some patterns of herbicide and growth regulator intake, persistence, and distribution in sugarcane.** *Arch. Environ. Contam. Toxicol.* 4(4): 385-394; 1976. (11 references)

Absorption of ^{14}C-labeled herbicices from nutrient culture solution through the roots of sugarcane plants (*Saccharum* spp. hybrids) resulted in three major types of distribution. Labeled residues from atrazine, ametryne, and metribuzin moved easily through the xylem to the green leaves and were deposited mainly at the left margins and tip. Senescence and leaf absicission removed most of the deposit from the plant. Picloram translocated rapidly into the leaves, but appeared to recycle from older to younger leaves with only small portions remaining in the senescent leaves. Asulam and pentachlorophenol (PCP) were absorbed by the roots; residues did not pass into the xylem and remained fixed in the roots. Foliar additions of labeled herbicides and growth regulators generally showed only minor absorption and translocation within the leaf. Weathering processes and volatility during a 6- to 12-week period left variable amounts of residue, characteristic of individual compounds, adsorbed at the treated sites. (Author abstract by permission)

77-0255. Huschenbeth, E.; Harms, U. (Inst. Kusten-Binnenfischerei, Bundesforschungsanst. Fischerei, Hamburg, Germany). **On the accumulation of organochlorine pesticides, PCB and certain heavy metals in fish and shellfish from Thai coastal and inland waters.** *Arch. Fischereiwiss.* 26(3): 109-122; 1975. (13 references)

Levels of DDT, TDE, DDE, lindane, dieldrin, and PCB were determined in 819 samples of 27 genera of fish, 4 genera of crustaceans, and 3 genera of molluscs from four fishing areas off the coast of Thailand and from three inland areas. In addition most of the samples were also analyzed for copper, zinc, cadmium, lead, and mercury. The PCB and pesticide levels were low, below those generally found in fish from the North Sea and more nearly comparable to those from the North Atlantic. The levels of heavy metals were comparable to those encountered in fish from the North Sea and more remote waters. Therefore there seems to be no immediate need for the development of an extensive monitoring program for these pollutants in Thailand at present. Repetition of this study from time to time would probably be sufficient.

77-0256. Orgill, M. M.; Sehmel, G. A.; Petersen, M. R. (Battelle, Pacific Northwest Labs., Richlan., WA 99352). **Some initial measurements of airborne DDT over Pacific Northwest forests.** *Atmos. Environ.* 10: 827-834; 1976. (11 references)

The rate of DDT resuspension from a forested area as indicated by airborne DDT levels was measured after a Pacific Northwest forest area was sprayed with DDT to control a tussock moth infestation. The information was extrapolated to DDT translocation in the environment by resuspension and volatilization processes. Airborne DDT particulates and vapor were sampled using an aircraft-mounted high-volume sampler on four consecutive days. Air samples other than the background samples taken upwind of the spray areas and some of the high altitude samples contained significant amounts of *p,p'6ΔΔTo,p'*-DDT, and *p,p'*-DDE. The maximum total DDT concentration of 19 ng/m^3 was collected about 2 hr after spraying and about 150 m above the trees. Concentrations had declined to 2 ng/m^3 or less after 26 hr. The particulate DDT concentrations were generally larger than vapor DDT concentrations. The predominant mechanisms for DDT translocation were valley-slope winds, convection, and convective turbulence. Resuspension rates for DDT were from 10^{-7} to 10^{-8} fraction resuspended per second. Within 86 days after spraying airborne DDT levels had decreased to background.

77-0257. Peakall, D. B. (Toxic Chem. Div., Can. Wildlife Serv., Environ. Canada, Ottawa, Ontario, Canada). **DDT in rainwater in New York following application in the Pacific Northwest.** *Atmos. Environ.* 10(10): 899-900; 1976. (8 references)

The aerial spraying of timberlands in the Pacific Northwest in the summer of 1974 for infestation by the tussock moth represents the only major use of DDT in North America since the imposition of restrictions on its use in 1971 and 1972. DDT and DDE were detectable in rainwater in the eastern U.S., about 4000 km from the presumed source, for several months after completion of the spray program. Rain and snow samples were collected near Ithaca, NY, from August 1974 to September 1975; wet and dry fallout were also collected separately in a special apparatus. DDT was detected in all samples collected before Dec. 1 and possibly in the Dec. 6-18 sample, but not thereafter. The concentration of DDT detected generally declined from early August to late November 1974, but definitive proof is not available that the Pacific Northwest spraying program was the source of the DDE in

Ithaca. The findings indicate that DDT remains in the atmosphere for at least several days (coast to coast transport).

77-0258. Fung, K. H.; Belcher, R. S.; Downie, W. A. (Dep. Agric., Melbourne, Australia). **Foliar damage, residue levels and tuber yield in potato treated with various concentrations of 2,4-D at three stages of growth.** *Aust. J. Exp. Agric. Anim. Husb.* 16(80): 423-427; 1976. (3 references)

A field trial was conducted on potato plants treated with 2,4-D at 0.0.1, 1 and 10 ppm at the time of emergence, flowering, and flower drop. Foliar damage symptoms were noted one month after treatment. Residues of 2,4-D in foliage and tubers were determined by gas chromatography with a detection limit of 0.005 ppm and 81-87% recoveries. Residue levels of 0.110 ppm 2,4-D were found in the slightly damaged foliage following application at flower drop, but only 0.010 ppm were found in severely damaged foliage following application at emergence. The tubers contained trace residues of 2,4-D after the plants had reached maturity.

77-0259. Domanski, J. J.; Sheets, T. J. (Pestic. Residue Res. Lab., Raleigh, NC). **Environmental contamination of flue-cured tobacco with chlorinated hydrocarbon insecticides.** *Beitr. Tabakforsch.* 8(5): 330-333; 1976. (10 references)

Field studies were performed on indirect contamination of tobacco by organochlorine compounds in soil. Levels of DDT + TDE in soil ranged from less than 0.01 to 0.18 ppm and those in cured leaves ranged from 0.11 to 1.69 ppm. Plant-bed soils did not appear to be a major source of DDT + TDE residues in cured tobacco. Residues of endrin and dieldrin were near or below the limit of detection (0.01 ppm) in soil and cured leaf. Residues of toxaphene ranged from less than 0.1 to 4.7 ppm in soil and less than 0.3 to 7.7 ppm on tobacco. DDT residues in the bottom stalk position were positively correlated with the residues in soil, while toxaphene residues in the bottom and top stalk positions were positively correlated with soil residues. Toxaphene residues in soil ranged from < 0.1 to 4.7 ppm and in tobacco from < 0.3 to 7.7 ppm. Contamination by toxaphene appeared to be attributable to uptake from soil and movement through air in the solid form (drift) or as a vapor.

77-0260. Maeda, O.; Miyata, T.; Honda, H.; Saito, T. (Public Health Res. Inst. Kyoto City, Kyoto, Japan). **Fate of insecticide used on paddy fields for controlling the vector mosquito of Japanese encephalitis epidemics.** *Bochu-Kagaku* 41(2): 60-64; 1976. (3 references) (Japanese)

Residues of fenthion and its metabolites were determined in rice grains, straw and soils collected in the autumn of 1972 and 1973 from a suburban area of Kyoto City where the insecticide had been sprayed since 1967 to control the vector of Japanese encephalitis. Fenthion and its metabolites were analyzed quantitatively by GLC; insecticidally active material was estimated by a bioassay with *Culex tritaeniorhynchus* larvae. Levels of fenthion were below the GLC detection limits, but insecticidal activity was detected in the bioassay. The herbicides CNP and nitrofen have been widely used on paddy fields in the Kyoto area in recent years, so their insecticidal activity was investigated in the laboratory. Some activity was demonstrated, but its significance cannot be determined exactly.

77-0261. Richou-Bac, L.; Restuit, A.; Pantaleon, J. (Lab. Cent. Hyg. Aliment., Min. Agric., Paris, France). **Residus de pesticides dans les aliments pour animaux. Evaluation des normes de tolerance.** [**Pesticide residues in animal feeds. Evaluation of tolerance standards.**] *Bull. Acad. Vet. Fr.* 48(9-10): 483-498; 1975. (11 references) (French)

Despite the declines in organochlorine residue levels in foods following restrictions on their use, residues remain present and significant. In France the residue standards and levels are studied primarily by the Interministerial and Interprofessional Commission on Animal Feed and the Commission for the Study of Pesticidal Products. Studies have revealed that the levels of α- and β-BHC, heptachlor epoxide, and dieldrin have declined during the past 5 years in France since several administrative measures have been applied, but that the levels of lindane and HCB have remained fairly constant, though they were never very high.

77-0262. Miller, J. M.; Singh, J. (Dept. Chem., Brock Univ., St. Catharines, Ont., Canada L2S 3A1). **A GC/MS investigation of organic chemical residues found in agricultural soils.** *Bull. Environ. Contam. Toxicol.* 16(4): 383-391; 1976. (6 references) [Note: This abstract represents the material found on pp. 383-391; the title and author information in the original journal were erroneously exchanged for that of the article on pp. 483-485 (*Pesticides Abstracts* no. 77-0265).]

After high mercury levels were found in the vegetation of the stream receiving waste liquors from a seed potato treatment plant, the operation of the plant was examined. Sediments from the stream above the potato treatment plant contained 0.26 ppm of mercury, the sediment at the waste water culvert outfall contained almost 6 ppm of mercury before the potato treatment season, and sediments 800 m farther downstream contained 0.46 ppm. Sediments at the culvert outfall contained 100 ppm of mercury and at the more remote site 10 ppm of mercury within 2 mo after treatment started. The sediment mercury at the outfall declined to less than 14 ppm within one month after treatment was stopped and to less than 2 ppm at the remote site. The mercury content of the submerged macrophyte *Callitriche* sp. increased dramatically from 1 ppm to 2215 ppm dry weight at the outfall site 2 during the

treatment season and to more than 700 ppm at the remote site. Mean mercury levels of 8-9 ppm were found in fresh muscle tissue from brown trout and grayling in the treatment season but dropped rapidly to below 1 ppm therefore. Treating the spent dressing liquor with sodium sulfide and ferric chloride reduced mercury levels in the supernatant to the point where it could be sprayed on waste land. Mercury contamination of the water was minimal the following year.

77-0263. Zitko, V. (Environ. Canada, Biol. Stn., St. Andrews, New Brunswick, Canada EOG 2XO). **Levels of chlorinated hydrocarbons in eggs of double-crested cormorants from 1971 to 1975.** *Bull. Environ. Contam. Toxicol.* 16(4): 399-405; 1976. (9 references)

Eggs collected from nests of double-crested cormorants on Whitehorse Island in the Bay of Fundy were boiled and stored frozen until analysis by gas chromatography for organochlorine compounds. Arithmetic-mean HCB levels were practically constant at 0.016 μg/g wet weight in 1973-1975; PCBs declined from 14.3 μg/g in 1971 to 5.2-5.5 μg/g in 1973-75; *p,p'*-DDE dropped from 9.70 μg/g in 1971 to about 2 ppm in 1974-1975. Dieldrin values of 0.297 μg/g were recoreded in 1972, 0.117 μg/g in 1973, 0.041 μg/g in 1974, and 0.156 μg/g in 1975. Average levels of *p,p'*-DDT were 0.113, 0.053, 0.202, and 0.068 μg/g in 1972-1975, and *p,p'*-DDT levels were 0.167, 0.073, 0.023, and 0.075 μg/g in the same years. Mirex was analyzed by performing a single determination on a combined extract, and values of 0.058, 0.059, and 0.113 μg/g were found for 1973, 1974, and 1975.

77-0264. Bond, W.; Roberts, H. A. (Natl. Vegetable Res. Stn., wellesbourne, Warwick, England). **Persistence of metamitron in a sandy loam soil.** *Bull. Environ. Contam. Toxicol.* 16(4): 431-435; 1976. (2 references)

Loss patterns of herbicidal activity were assessed following field application of metamitron and under controlled temperature and moisture conditions using a lettuce bioassay. When metamitron was applied to a sandy loam soil at 4.5 and 9.0 kg/ha in mid-April the residual activity decreased to ca. 60% of the initial level within 2 wk, then declined gradually, reaching 40% after 2 mo and 20% after 4 mo. The decrease in activity was more rapid when herbicide was applied during the third week in July: in this case the activity dropped below the 20% mark in less than 3 mo. Leaching was minimal; activity found at the 7.5-10 cm depth represented no more than 10% of the total in the whole 10 cm soil layer. More than half was always found in the surface 2.5 cm. Soil incorporation had little effect on the rates of disappearance.

77-0265. Caines, L. A.; Holden, A. V. (Freshwater Fish. Lab., Pitlochry, Perthshire, Scotland). **Stream pollution by an organomercury compound.** *Bull. Environ. Contam. Toxicol.* 16(4): 483-485; 1976. (4 references) Note: This abstract represents the material found on pp. 483-485; the title and author information in the original journal were erroneously exchanged for that of the article on pp. 383-391 (*Pesticides Abstracts* No. 77-0267).

Various agricultural soils were analyzed by GC/MS for well known pesticide residues as well as other organic chemical residues. One aim of the study was to discover the minimum workup procedure necessary for intelligible GC/MS results. DDT and its degradation products DDE, DDD, and 4,4'-dichlorobenzophene were detected four years after the last application of DDT to sampled areas. Linuron, diuron, dichloroaniline, and 3,4-dichloroformylanilide were detected in an area where diuron had been applied. Atrazine was detected in unchanged form. A series of phthalate compounds were also detected. The analytical method employed comprised extracting the soil samples separately with benzene and acetonitrile, and cleaning up the benzene extracts on a florisil column with hexane, 1:1 hexane/dichloromethane, 1:1 hexane/ether, and ether as eluting solvents. Alternatively the soils were moistened with water, the acetonitrile concentrate extracted with hexane containing dichloromethane, phosphate buffer, and sodium sulfate. The concentrated hexane extracts were then cleaned up in the same manner as the benzene extracts. Concentrated extracts were then subjected to GC/MS analysis. Because of the vast amount of data obtained in such studies, surveys should be conducted using an interfaced computer with library search capabilities.

77-0266. Munson, T. O. (Westinghouse Ocean Res. Lab., Annapolis, MD 21404). **A note on toxaphene in environmental samples from the Chesapeake Bay region.** *Bull. Environ. Contam. Toxicol.* 16(4): 491-494; 1976. (7 references)

Toxaphene was identified by multicolumn electron-capture GLC in some of the environmental samples analyzed for chlorinated hydrocarbons in the Upper Bay area of Maryland. The rainwater samples from the Fort Smallwood collection site contained residues nearly identical to the toxaphene standard at levels of 280 ppt (parts per trillion) on Aug. 28-Sep. 4, 170 ppt Sep. 4-28, 44 ppt Sep. 28-Oct. 1, and 86 ppt Oct. 16. One rainwater sample from further inland (Sollers Point) also contained toxaphene at 220 ppt. One storm sewer content sample collected still further inland contained toxaphene at 13 ppt and a zooplankton sample collected near Sollers Point on July 8, 1974 contained toxaphene at 1.7 ppm (wet weight). The residue patterns in the latter samples did not match the standard as closely as did the rainwater samples. The PCB levels were low in the samples examined, and thus did not mask the presence of toxaphene.

77-0267. Pearson, J. E.; Schultz, C. D.; Rivers, J. E.; Gonzalez, F. M. (Dep. Med., Louisiana State Univ. Med. Cent., New Orleans, LA 70112). **Pesticide levels of patients on chronic hemodialysis.** *Bull. Environ. Contam. Toxicol.*

16(5): 556-558; 1976. (4 references)

Organochlorine pesticide levels were examined in chronic hemodialysis patients, since the dialysis patient is exposed to considerably greater quantities of water than normal individuals and therefore his pesticide burden might be altered. The lack of kidney function might also alter pesticide metabolism. The plasma levels of the three pesticides studied were statistically the same for the dialysis patients prior to a six-hour dialysis session, for dialysis patients at the end of this period, and for controls, averaging about 1.2, 3.5, and 16 ppb for DDE, DDT, and PCP. Dietary restrictions of dialysis patients might account for the differences in pesticide levels reported in other studies.

77-0268. Young, D. R.; McDermott, D. J.; Heesen, T. C. (S. Calif. Coastal Water Res. Proj., El Segundo, CA 90245). **Aerial fallout of DDT in Southern California.** *Bull. Environ. Contam. Toxicol.* 16(5): 604-611; 1976. (7 references)

As part of a continuing series of studies into the input of DDT and other chlorinated hydrocarbons into the Southern California Bight the levels introduced by dry aerial fallout of DDT were examined. Glass plates covered with mineral oil were left on a flat surface, generally a low building roof, for one week, then the collected material cleaned off by scraping and respraying with mineral oil-hexane. The samples were cleaned up by column chromatography and analyzed by gas chromatography. Seasonal differences in DDT flux were not apparent. The levels found over a coastline area from Point Conception to the US-Mexico border ranged from ca. 50 to almost 700 ng/m^2/day in 1973-74. The results generally increased with increasing proximity of the sampling station to Los Angeles rather than to the agricultural regions. The ratio of *p,p'*-DDT to *o,p'*-DDT observed in the Bight was 2.5:1, and these two isomers constituted approximately 70% of the total measurable flux of DDT compounds onto the Bight. Sampling stations were established near the site of a plant that formerly produced DDT and near the landfill that received the wastes from this plant up to 1972. DDT constituents collected here were at least an order of magnitude higher than elsewhere in Los Angeles. It was estimated from the results that about 1.3 metric tons/yr of DDT compounds fell onto the coastal waters annually in 1973-1974.

77-0269. Cockson, A.; Morgan, A. (Ind. Anal. Unit., Univ. Malawi, Limbe, Malawi). **DDT in babies' milk formula.** *Bull. Environ. Contam. Toxicol.* 15(5): 591-592; 1976. (4 references)

DDT-derived compounds were determined in samples of two proprietary brands of infant formula purchased from a supermarket in Malawi. Pesticides were initially detected in the extracts using thin-layer chromatography, then identified and quantitated by gas chromatography. No chlorinated hydrocarbon pesticides were detected in the 5% diethyl ether-petroleum ether extract. The petroleum ether extracts of the two milk brands revealed 0.02 and 0.03 ppm *o,p'*-DDE, 0.04 and 0.07 ppm *p,p'*-DDE, 0.01 and 0.01 ppm *p,p'*-DDT, and 0.03 and 0.03 ppm *p,p'*-DDT. These were on the same order as the values found in human breast milk in many countries.

77-0270. Deubert, K. H.; Gray, R. S. (Univ. Mass. Cranberry Exp. Stn., East Wareham, MA 02538). **Parathion residues in environmental samples from untreated areas.** *Bull. Environ. Contam. Toxicol.* 15(5): 613-616; 1976. (4 references)

Persistence of parathion in soil may be due to its complexation with organic matter and clay, and residues may translocate. Therefore two soil samples taken from a wooded area about two miles from the nearest parathion application site and oysters from Sippican Harbon, Marion, Mass., were analyzed for parathion with emphasis on confirmation. Parathion residues in soil were found as 1.3 ppb using a GLC apparatus with SE-30 packed column and 1.0 ppb on QF-1. The residue content of the homogenate was 41 ppb on QF-1 and 38 ppb on SE-30 following TLC cleanup. The quantities were obtained using 50% ether eluates. Parathion translocation was thus confirmed.

77-0271. Pollero, R.; Goyena, R.; Siquiroff, M.; Tumino, R. (Inst. Biol. Lab. Salud. Publ., La Plata, Argentina). **Removal of pesticides in water of Rio de la Plata (in vitro assay).** *Bull. Environ. Contam. Toxicol.* 15(5): 617-622; 1976. (6 references)

Analyses of water from a heavily contaminated coastal section of the Rio de la Plata had failed to reveal pesticide contamination. Factors which might be responsible for this lack were examined by incubating known amounts of heptachlor, malathion, endrin, and DDT in water obtained from this area at room temperature with air bubbling through for 72 hr. The percentages of pesticide remaining in the water with suspended matter removed after 72 hr were 55.4% for heptachlor, 109.0%*l for malathion*, 89.8% for endrin, and 62.7% for DDT. The quantities remaining in unfiltered water after 72 hr were 67.2% for heptachlor, 94.3% for malathion, 91.3% for endrin, and 74.0% for DDT. The quantities detected in the sediment centrifuged from the unfiltered water after 72 hr were 82.9% for heptachlor, 74.7% for and 68.0% for DDT. Codistillation was considered primarily responsible for removal of pesticides from the water; no degradation products were detected by GLC. The organochlorine pesticides are immediately adsorbed by the suspended matter, then may be gradually desorbed. Malathion was not adsorbed by sediment, and its minimal disappearance from the water coupled with its high solubility supports the importance of codistillation in pesticide removal.

77-0272. Wood, G. W.; Stewart, D. . R. (Agric. Can. Res. Stn., Fredericton, New Brunswick, Canada). **Fenitrothion residues in blueberry fields after aerial forest spraying.** *Bull. Environ. Contam. Toxicol.* 15(5): 623-629; 1976. (2 references)

During application of fenitrothion for control of spruce budworm in New Brunswick attempts have been made to avoid harming blueberry pollinators (fenitrothion is rated highly toxic to honeybees). Surveys were performed in 1972, 1973 and 1974 to determine the extent of fenitrothion drift into blueberry fields. Glass plates collected one-half to two hours after forest spraying in the 1972 survey accumulated residues corresponding to 0.17-14 g/ha; all collection sites were approximately three km from the sprayed areas. In the 1973 survey the residues collected at 3 km amounted to 0.99-18.04 g/ha, and in 1974 the residue levels ranged from 0 to 78 g/ha. Trace-0.15 g/ha were detected in fields 38-8 km from the spraying area in 1973, while in 1974 there was a detectable level of fenitrothion in only one field located more than 3 km from a sprayed block.

77-0273. Smith, J. C.; Farris, F. F.; Von Burg, R. (Dep. Pharmacol. Toxicol., Univ. Rochester, Sch. Med. Dent., Rochester, NY 14642). **Chemical type of mercury in patients in the outbreak of organomercury poisoning in Iraq.** *Bull. WHO 53 (Suppl.)* 61-63; 1976. (5 references)

Gas chromatography was employed to identify the mercurial compound involved in the Iraq outbreak of organomercury poisoning. Only methylmercury was detected in human blood, hair, and tissues. The quantity of methylmercury present correlated well with the quantity of organic mercury determined by selective atomic absorption. (Author abstract by permission)

77-0274. Magos, L.; Bakin, F.; Charkson, T. W.; Al-Jawad, A. M.; Al-Soffi, M. H. (MRC Toxicol. Unit, Med. Res. Council Lab., Woodmansterne Rd., Carshalton, Surrey, England). **Tissue levels of mercury in autopsy specimens of liver and kidney.** *Bull. WHO 53(Suppl.)* 93-97; 1976.

Fifty-one autopsy specimens of liver were analyzed for total mercury. Thirteen specimens contained less than 10 mg/kg of mercury, with a minimum value of 1.4 mg/kg, indicating that death in suspected cases was not always due to lethal exposure to methylmercury. The methylmercury concentration in 28 livers was 10-30 mg/kg. Limited additional estimations have shown that 71% of the liver mercury was organic and that the level of mercury in the liver of a 7-month-old fetus was only 25% of that in the liver of the mother. In a patient who died in hospital with a blood mercury level of 4.1 μg/ml, the liver contained 16.5 mg/kg of mercury. Differences between these results and those found in the outbreak of methylmercury poisoning in Japan are discussed. Any extrapolation of tissue mercury levels in relation to the toxic effects of methylmercury must take account of the intensity and duration of exposure. (Author abstract by permission)

77-0275. Al-Saleem, T.; Clin. Comm. Mercury Poisoning (Dep. Pathol., Coll. Med., Univ. Baghdad, Baghdad, Iraq). **Levels of mercury and pathological changes in patients with organomercury poisoning.** *Bull. WHO 53(Suppl.):* 99-104; 1976. (6 references)

Autopsies were carried out on 4 adults who died during the outbreak of mercury poisoning in Iraq and on 4 infants who were exposed to organomercury *in utero*. Mercury levels in tissues and in some body fluids were determined. The high levels of mercury in the central nervous system and the marked neuronal degeneration are noted. (Author abstract by permission)

77-0276. Al-Shahristani, H.; Shihab, K.; Al-Haddad, I. K. (Coll. Eng., Univ. Baghdad, Baghdad, Iraq). **Mercury in hair as an indicator of total body burden.** *Bull. WHO 53 (Suppl.):* 105-112; 1976. (12 references)

Hair is known to concentrate mercury, and in general the concentration of mercury in hair is proportional to and many times higher than its concentration in the blood. The variation of the mercury concentration in human head hair was used to follow the history of poisoning in people who ingested grain treated with methylmercury. Instrumental neturon activation analysis was used for mercury determination. The initial rising slope of mercury concentration along the hair was proportional to the daily intake of methylmercury per kg of body weight. The ratio of the concentration of methylmercury in human head hair to the average body concentration was found to be about 137. By using this ratio and measuring mercury concentration in hair, the total body burden can be calculated. In the patients studied, the peak body burden ranged from 0.8 to 4.4 mg/kg in cases showing mild symptoms, from 1.5 to 6 mg/kg in cases with moderate symptoms, and from 3 to 12 mg/kg in cases with severe symptoms. The curve of the variation in mercury concentrations along the hair was also used to calculate the biological half-life of methylmercury in man. Forty-eight cases were studied and it was found that the frequency curve (population distribution curve) was grouped into two distinct regions. In about 90% of the population the biological half-life of methylmercury was 35-100 days, and 10% showed high values of 110-120 days. (Author abstract by permission)

77-0277. Jernelov, A. (Swedish Water Air Pollut. Res. Lab., Stockholm, Sweden). **Environmental contamination by mercury in Iraq.** *Bull. WHO* 53(Suppl.): 115-118; 1976.

Following the outbreak of organomercury poisoning in Iraq, an investigation was carried out during the spring and summer of 1972 to evaluate environmental contamination by organomercury. Analyses were performed on fish of several species (not typical predators) and on a few specimens of aquatic birds (not fish-eating). Most fish samples contained concentrations in muscle ranging from 0.01 to 0.15 mg/kg. These concentrations are within the range found in tropical rivers. Higher figures, 0.3-0.5 mg/kg, were found downstream from a caustic soda plant south of

Baghdad. A few cases of very high mercury concentrations (25-30 mg/kg) were reported from an area where fish kills had occurred. Aquatic birds (ducks and waders) contained low concentrations of mercury (900-2750 ng/g). Tail feathers of seed-eating birds were found to contain 13,500-21,000 ng/g of mercury, which is about 10 times higher than values reported from Ethiopia and within the range from the Sweden and Canada. Insect-eating birds contained 1850-5200 ng/g, which is thought to be slightly elevated. Extremely high concentrations of mercury were found in muscle tissue of sead-eating birds (15,000-40,000 ng/g), while feathers contained similar concentrations (9000-52,000 ng/g). These extremely high concentrations were found only in the vicinity of storehouses where treated seed was kept. No birds of prey could be caught and analyzed. (Author abstract by permission)

77-0278. Bakir, F.; Al-Shahristani, H.; Al-Rawi, N. Y.; Khadouri, A.; Al-Mufti, A. W. (Coll. Med., Univ. Baghdad, Baghad, Iraq). **Indirect sources of mercury poisoning in the Iraq epidemic.** *Bull. WHO* 53 (Suppl.): 129-132; 1976. (4 references)

Secondary sources of intoxication with methylmercury other than home-made bread were explored. Mercury levels in various food items were below 0.05 mg/kg. OVer 30,000 specimens of meat and internal organs of sheep were analyzed because of the strong suspicion that the animals had been fed treated barley. It was found that 6-12% of the specimens analyzed contained more than 0.5 mg/kg of mercury. Consumption of meat did not appear to present a danger of intoxication during the outbreak. (Author abstract by permission)

77-0279. Almeida, W. F.; Pregnolatto, W.; Pigati, P. (Biol. Inst., Sao Paulo, Brazil). **Misuse of organomercury fungicides in Brazil.** *Bull. WHO* 53(Suppl.): 133-138; 1976. (4 references)

A methoxyethyl mercuric compound, licensed in Brazil as a fungicide for seed dressing, was widely used for spraying tomato and other vegetable crops in 1966 and 1967. Mercury residues ranging from 0.05 to 0.30 mg/kg were detected in 14% of the tomatoes, 13% of other vegetable samples, and 57% of the tomato paste batches. A wide campaign through newspapers, radio, and television was quickly established to educate farmers and the population in general on the hazards of ingestion of mercury-contaminated food. All samples of tomatoes and other vegetables positive for mercury (residues above 0.05 mg/kg) were destroyed. Inspection posts on the main roads and highways prevented the delivery of contaminated food to cities and food processing plants. The sale of organomercury fungicides is now controlled in Brazil; however, treated seeds which are not planted may be diverted to human or animal consumption. There is no official record of accidents, but occasional cases of poisoning are known. The mercury residue level in Brazilian fish is low, indicating that environmental pollution by mercury is not a big problem in the country. However, some fresh-water and estuarine fish may contain mercury residues ranging from 0.01 to 0.66 mg/kg. (Author abstract by permission)

77-0280. Khan, S. U.; Belanger, A.; Hogue, E. J.; Hamilton, H. A.; Mathur, S. P. (Chem. Biol. Res. Inst., Res. Br., Agric. Canada, Ottawa, Ontario K1AOC6, Canada). **Residues of paraquat and linuron in an organic soil and their uptake by onions, lettuce and carrots.** *Can. J. Soil Sci.* 56(4): 407-412; 1976. (10 references)

Paraquat and linuron were applied to an organic soil, as spray treatments, at rates of 1.12 and 2.24 kg/ha, and 2.24 and 4.48 kg/ha, respectively. The persistence of the herbicides and their residues in lettuce (foliage), onions (root), and carrots (foliage and root) at harvest time were studied under field conditions. Proportionately more residues persisted in the soil from the higher rates of application of paraquat (2.24 kg/ha) and linuron (4.48 kg/ha). About 83-86% of the initial amounts of paraquat and 59-74% of the linuron remained in the soil 4 mo after application. Furthermore, about 50% of the paraquat was recovered from the treated soil 15 mo after application, whereas only about 20% of the linuron was recovered at the end of the same period. Carrots grown in this soil did not absorb detectable (> 0.005 ppm) amounts of linuron, while onions and lettuce grown 12 mo after application absorbed the herbicide in various amounts. At the lower rate of application (2.24 kg/ha) linuron residue in onions was 0.014 ppm and that from the higher application rate (4.48 kg/ha) was 0.046 ppm. Lettuce had about 0.009 ppm residue, irrespective of the rate of application. Onions and lettuce grown on paraquat-treated soil had low residue levels (0.001-0.011 ppm). The study demonstrates the potential of paraquat and linuron residues to persist in organic soil, and their uptake by vegetable crops. (Author abstract by permission)

77-0281. Frank, R.; Braun, H. E.; Ishida, K. S.; Suda, P. (Prov. Residue Test Lab., Ontario Min. Agric. Food, Univ. Guelph, Guelph, Ontario, Canada). **Persistent organic and inorganic pesticide residues in orchard soils and vineyards of southern Ontario.** *Can. J. Soil Sci.* 56(4): 1976. (18 references)

Soils from apple, cherry and peach orchards and vineyards were collected between 1972 and 1975 for analyses of major metals found in inorganic pesticides and for organochlorine and organophosphorus pesticides. The pattern of pesticide use for fruit production in Ontario between 1892 and 1975 was reviewed for those compounds included in this chemical survey. The use of lead arsenates on apple orchards over the past 70 yr elevated arsenic and lead from background levels (7.4 ppm As and 6.4 ppm Pb) to 121 ppm As and 774 ppb Pb. Accumulations in cherry orchard soils, where a lesser volume was used annually, were considerably lower.

Levels in both peach and vineyard soils were only slightly above background contents. Twenty years of recommended use of phenyl mercuric acetate, a scab eradicant, elevated the mercury content in apple orchard soils from 0.08 ppm to 0.29 ppm. Copper salts used as fungicides over the past 80 yr have produced only small elevations in copper content of some orchard soils. In apples the increase was from 21 ppm to 63 ppm in a 70-yr time period. The use of compounds containing iron, manganese and zinc had no effect on soil content of these metals. Sixteen organochlorine acaricides and insecticides recommended for use in orchards were sought in the survey. The most frequently found, and no longer used, were DDT, TDE and their metabolite DDE; apple and peach orchards had the highest mean residues of 43.3 and 9.22 ppm ΣDDT, respectively. Other organochlorine insecticides found were endosulfan, endrin, HEOD, and methoxychlor; with the exception of endosulfan, residues were well below 1 ppm. The acaricide dicofol was present in apple, sweet cherry and peach soils. No organochlorine fungicides were detected. Heptachlor epoxide and lindane were found in some orchard soils at trace levels; neither was recommended for use in orchards. Thirteen organophosphorus insecticides recommended for use in orchards were sought in the survey; however, only ethion and parathion were found at trace levels. (Author abstract by permission)

77-0282. Schmeltz, I.; Abidi, A.; Hoffmann, D. (Div. Environ. Carcinogenesis, Naylor Dana Inst. Dis. Prevent., Amer. Health Fdn., Valhalla, NY 10595). **Tumorigenic agents in unburned processed tobacco: *N*-nitrosodithanolamine and 1,1-dimethylhydrazine.** *Cancer Lett.* 2(3): 125-132; 1977. (4 references)

The first isolation of the tumorigenic agents *N*-nitrosodiethanolamine and 1,1-dimethylhydrazine from tobacco is reported. *N*-nitrosodiethanolamine is a weak carcinogen in rats. Levels in unburned cigarette tobacco varied from a low of 0.1 ppm in flue-cured tobacco not treated with the herbicide MH-30 (maleic hydrazide) to a high of 173 ppb in burley tobacco to which the herbicide had been applied as the diethanolamine salt prior to harvesting. Levels of 1,1-dimethylhydrazine (which has been reported to induce tumors in mice) ranged from 60 to 147 ppb in various tobaccos; however, none was detected in Burley tobacco at a detection limit of 0.1 ng. The MH-30 appeared to represent the source of nitrosamine in the tobacco, while the source of dimethylhydrazine has not been determined.

77-0283. Steinwandter, H. (Hessische Landwirtschaftl. Versuchsanst., Darmstadt, Germany). **Beitraege zur Adsorption von Chlorkohlenwasserstoffen an Polyaethylen. I. Adsorption von HCB aus der Gasphase. [Adsorption of organochlorines on polyethylene. Gas phase HCB adsorption.]** *Chemosphere* 5(4): 241-244; 1976. (4 references) (German)

HCB levels determined in samples of moldy grain stored in polyethylene sacks increased with increasing proximity of the sampling site to the plastic surface. The walls of the bags were rinsed with petroleum ether; as much as 1 ppm HCB was detected on the polyethylene, while the HCB contents in the grain reached a maximum of 0.02 ppm. In another experiment clean polyethylene strips were placed on the top of beakers containing grain samples to eliminate the possibility of transfer by direct contact. Quantities of HCB recovered from the grain were directly proportional to the time the plastic remained in place, thus confirming that vapor was the primary means of transfer. It was deduced that the HCB is evaporated from the grain, then deposited on the plastic bags during storage. This possible source of error in grain analyses should also be evaluated for other organochlorine compounds.

77-0284. Steinwandter, H. (Hessische Landwirtschaftl. Versuchsanst., Darmstadt, Germany). **Beitraege zur Umwandlung der HCH-Isomere durch Einwirkung von UV-Strahlen. I. Isomerisierung des Lindans in α-HCH. [Transformation of BHC isomers by UV. I. Isomerization of lindane to α-BHC.]** *Chemosphere* 5(4): 245-248; 1976. (13 references) (German)

Isomerization of lindane to α-BHC has previously been demonstrated in soil and plants, but the mechanism was unknown. However, it was known that the reaction required an energy input, and therefore the role of UV was examined. Lindane was irradiated both in solution and in the solid phase. Quantitative conversion of lindane was observed following long irradiation times (5 hr) in aqueous solution. No petroleum ether-extractable products were present in the reaction solution, and therefore it was assumed that hydroxylation or polymerization primarily occurred. An additional BCH isomer, δ-BHC, formed in the solid phase. Additional conversion products identified were pentachlorobenzene and pentachlorocyclohexene.

77-0285. Parlar, H.; Gaeb, S.; Nitz, S.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen-Umweltforsch. mbH, D-8051 Attaching, Germany). **Beitraege zur oekologischem Chemie CXXVII. Zur Photochemie des Toxaphens: Reaktionen von chlorierten Bornanderivaten in Loesung und adsorbiert and Kieselgel. [Contributions to ecological chemistry part 127. Photochemistry of toxaphene:reactions of chlorinated bornane derivatives in solution and adsorbed on silica gel.]** *Chemosphere* 5(5): 333-338; 1976. (15 references) (German)

Solutions of the principal component of toxaphene as well as two model bornanes in methanol/water and in *n*- hexane were irradiated with a mercury vapor lamp (> 230 nm). About 30% of the etoxaphene component was converted after 24 hr, principally to the monodechlorinated and dehydrochlorinated products. The mixture also contained unidentified lower chlorinated

products. The model substances 2 endo,6-endo-dichlorobornane and 2-exo,10-dichlorobornane were recovered quantitatively unchanged after 4 hr irradiation. The model substances and technical toxaphene were also adsorbed on silica gel and irradiated, resulting in complete mineralization after 168 hr.

77-0286. Sakriss, E.; Gaeb, S.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen- Umweltforsch. mbH, D-8051 Attaching, Germany). **Beitraege zur oekologischen Chemie CXXVIII. Photoooxidations- reaktionen von Methabenzthiazuron in Loesung. [Contributions to ecological chemistry part 128. Photooxidation reactions of methabenzthiazuron in solution.]** *Chemosphere* 5(5): 339-348; 1976. (15 references) (German)

The photoreactions of methabenzthiazuron in solution following irradiation at wavelengths above 290 nm in the presence of oxygen and water were examined. When methabenzthiazuron was dissovled in acetone and irradiated 48 hr 85% of the methabenzthiauron was recovered unchanged. A small quantity of a product was isolated which corresponded to oxidative demethylation on the remoter nitrogen of the urea group. When photolysis was performed in an acetone-water mixture (7:6) with oxygen bubbled in, methabenzthiazuron was completely eliminated within 83 hr and a large number of photoproducts were recovered and separated. Complete degradation was achieved in 140 hr in methanol/water (10:3). The products in this case were those representing various stages after oxidative opening of the aromatic ring and oxidation of the sulfur in the thiazole ring.

77-0287. Harger, T. R. (Univ. Kentucky, Lexington, KY 40506). **Soil dissipation of dicamba and VEL-4207.** *Diss. Abstr. Int. B* 36(9): 4253-4254; 1976.

VEL-4207, synthesized to eliminate some disadvantages of its parent dicamba, is non-volatile, nonleachable, and more persistent than dicamba. Soil dissipation of dicamba and VEL-4207 was examined under field and laboratory conditions. Soils treated with dicamba and VEL-4207 were applied to the top of soil columns and 1.3 cm of water was added per day to the column for 145 days. Less than 18% of the total radioactivity was collected in the leachate for 4 soil types. Most of the radioactivity collected from the soils with highest leaching was obtained within the first two weeks and was composed primarily of dicamba present in the treated soil when it was applied to the columns. Under field conditions after 16 weeks of the growing season, 16 and 60% of the applied dicamba and VEL-4207 respectively remained in the 0 to 7.5 cm soil section. The metabolite 3,5-dichlorosalicylic acid (DCSA) was found in soil treated with both compounds. Flooded conditions reduced the rate of VEL-4207 degradation in all soils and had varied effects in the case of dicamba. DCSA built up under flooded conditions in both dicamba and VEL-4207 treated soil. The major degradation product of both compounds was unextracted radioactive residue. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 76-6132).

77-0288. Kennedy, J. M. (Univ. Arkansas, Fayetteville, AR 72701). **Comparative persistence of dinitroaniline type herbicides on the soil surface.** *Diss. Abstr. Int. B* 37(5): 2006; 1976.

Effects of temperature in UV light and dark were demonstrated in the laboratory by applying the herbicides to TLC plates of soil. Losses were quantitated after extraction of the herbicide from the soil by electron-capture GLC. Butralin was least affected in 24 hr by UV light of the dinitroanilines evaluated and while no significant differences in herbicide losses in 24 hr (3 to 15%) were found between butralin, penoxalin, profluralin, trifluralin, isopropalin, oryzalin, nitralin, fluchloralin, and benefin, losses did occur. Dinitramine (23% loss in 24 hr) was most affected by the UV light. Butralin, oryzalin, nitralin, isopropalin, and dinitramine were least affected by 45°C in the dark with losses of 2 to 10%. Profluralin (34%), benefin (25%), and trifluralin (18%) were most volatile. The trifluoromethyl group was a common structural component where moisture affected the compound's loss. Five field experiments were conducted over a 3-year period to evaluate the persistence of 10 dinitroaniline herbicides by delaying incorporation for 1, 3, and 7 days after application. Herbicidal activity in the field was assessed by a sorghum bioassay and by GLC analysis of soil samples. Herbicides least affected by a 1-day delay in incorporation were oryzalin, nitralin, butralin, dinitramine, fluochloralin and penoxalin. Dinitramine was least persistent after incorporation. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 76-26,414).

77-0289. Ochiai, M.; Hanya, T. (Tokyo Metrop. Univ., Dep. Chem., Tokyo, Japan). **Alpha- and gamma-BHC in Tamagawa River water, Japan (September 1968 to September 1969).** *Environ. Pollut.* 11(3): 161-166; 1976. (6 references)

The concentrations of BHC residues in Tamagawa river water in an urban region of Japan were determined at three sampling sites during the period September 1968 to September 1969. The concentrations of BHC residues ranged from 5 to 577 ng/liter (α-BHC) and from 5 to 234 ng/liter (γ-BHC) and were highest in summer. The higher summer concentrations of BHC residues were considered to reflect the period when BHC was used. (Author abstract by permission)

77-0290. McClure, V. E. (Nat. Mar. Fish. Serv., Ocean. Atmos. Admin., Southwest Fish. Cent., La Jolla, CA 92037). **Transport of heavy chlorinated hydrocarbons in the atmosphere.** *Environ. Sci. Technol.* 10(13): 1223-1229; 1976. (24 references)

Fluxes of aerosol polychlorinated biphenyl (PCB, 54% chlorine mixture) ranging from 2×10^{-9} to 9×10^{-7} (average: 3×10^{-7}) g m^{-2} day^{-1} were measured at La Jolla, Calif., during February and October 1972. A model for mesoscale aerosol transport which treats the plume as a superposition of Gaussian-shaped puffs diffusing isotropically in the plane of the horizon was used with the assumption that deposition occurs irreversibly to compute source

strength, aerosol half-life, and isopleths of deposition flux. Hourly wind velocity and daily deposition flux measurements made during a one-month period were used to calibrate the model, and a second month of data provided a check for the predictive capacity of the method. On the basis of flux measurements and model calculations, arguments are presented for most dry deposition of aerosol PCB introduced into the troposphere to occur within 100 km of the source. (Author abstract by permission)

77-0291. Wolfe, N. L.; Zepp, R. G.; Gordon, J. A.; Baughman, G. L.; Cline, D. M. (Environ. Res. Lab., Environ. Protect. Ag., Athens, GA 30601). **Kinetics of chemical degradation of malathion in water.** *Environ. Sci. Technol.* 11(1): 88-93; 1976. (19 references)

Acid degradation of malathion is too slow to be important under environmental reaction conditions. However, alkaline degradation is fast enough to be a competitive degradation pathway in the environment. The products of alkaline degradation are temperature dependent. Oxidation by molecular oxygen is too slow under acidic conditions to be a degradation pathway. Photolysis is slow in distilled water but may be important in natural waters. (Author abstract by permission)

77-0292. Inoue, Y.; Abe, S.; Takamatsu, M.; Aoki, N.; Miki, S.; Fujiwara, K. (Dep. Environ. Health, Sci. Med., Kurume Univ., Kurume, Japan). **PCB, DDT and BCH levels in human plasma as a measurement of tissue residue.** *Fukuoka Igakkai Zasshi* 66(10): 610-616; 1975. (24 references) (Japanese)

Following the epidemic of yusho (polychlorinated biphenyl poisoning) in Japan serum PCB levels were used to evaluate PCB poisoning since 1974. However, the relationships between serum PCB levels and total body burdens were unknown. Paired surgical specimens were obtained from 33 patients. Additional samples were obtained from 21 persons: 21 blood samples, 2 samples of subcutaneous adipose tissue, one sample of liver tissue, and one of kidney tissue. The gas chromatographic patterns and levels of PCBs were determined in these samples along with β-BHC, p,p'-DDE, and p,p'-DDT. In the case of the surgery patients plasma PCB levels averaged 6.1 ppb, and adipose levels 2.6 ppm; plasma DDE was 20.1 ppb and adipose 11.9 ppm, plasma DDT was 3.5 ppb and adipose 1.4 ppm; and plasma β-BHC was 14.4 ppb and adipose 15.7 ppm. Higher levels of these compounds were found in emaciated patients than in non-emaciated individuals. Very high plasma PCB levels (92 and 230 ppb) were found in 2 cases).

77-0293. Beitz, H. (Inst. Pflanzenschutzforsch., Akad. Landwirtschaftswiss., Kleinmachnow, DDR). **Rueckstandstoxikologische Probleme beim Ensatz fon Pflanzenschutzmitteln und Wachstums-regulatoren in der Obst- und Gemueseproduktion. [Problems of residue toxicology in the application of pesticides and growth regulators in fruit and vegetable production.]** *Gartenbau* 20(4): 106-109; 1973. (German)

Pressure to increase agricultural productivity by increasing pesticide use has resulted in the need for establishing waiting times before harvest and regulating application. Many factors influence residue persistence on crops. Legislation has been passed limiting the use of very persistent products, but emergency exemptions may be granted. Certain crops present special residue problems due to growing conditions favoring pest propatagion, special application conditions, or metabolic peculiarities of the plants. Residue problems presented by herbicides are minimal despite their widespread use. Triazine herbicides are persistent in soil but are not readily accumulated by plants.

77-0294. Buslovich, S. Yu.; Mal'china, M. G. (Beloruss. Sci. Res. Inst. Sanit. Hyg., Minsk, USSR). **Izuchenie dinamiki razlozheniya aminnoi soli 2,4-D v pochve. [Dynamics of disappearance of 2,4-D amine salts in soil.]** *Gig. Sanit.* 41(5): 109-110; 1976. (2 references) (Russian)

When 2,4-D amine salt was applied at levels of 103 kg/ha under the conditions prevailing in Belorussia the herbicide disappeared from the cultivated soil layer within 1 mo. The precipitation level during the tests was normal for non-arid regions. Under these conditions the concentration of herbicide in the soil was directly proportional to the dose applied and inversely related to time and temperature. On the other hand the maximum herbicide level reached was equaled in peaty soil. The 2,4-D amine salt disappeared rapidly in soil of low organic matter content.

77-0295. Goldenberg, N.; Matheson, H. R. (Marks and Spencer, Baker Street, London W1). **Off-flavours in foods, a summary of experience: 1948-74.** *Chem. Ind. (London)* 13: 551-557; 1976. (26 references)

Sources of undesirable flavors in various foods were pursued by analyzing the history and composition of foods returned as customer complaints. More than 300 rejects were received over an 11-year period of cookies described as having an "antiseptic" taste. These off flavors were found not to have originated in the raw materials, water supply, or equipment. Finally a laboratory technologist noticed a "disinfectant" smell outside the factory, and occurrence of this smell was rougly correlated with customer complaint dates. Two herbicide factories releasing chlorophenols into the air were located within a five-mile radius of the cookie factory. The undesirable smell was reproduced by exposing baked cookies by gas chromatography. In some cookies exposed for 10 min to air 300 yards from the factory 0.08 ppm of mixed chloro-*o*-cresols were detected, and the smell and taste of the cookies were highly offensive. Chlorophenols were very often implicated in contamination incidents because of their strong odor; other contaminants were of microbial origin or were due to paints or solvents. Catty off flavors

due to interaction of mesityl oxide with hydrogen sulfide or sulfhydryl groups are more common than expected.

77-0296. Goldenberg, N.; Matheson, H. R. (Marks and Spencer, Baker Street, London W1). **Off-flavours in foods, a summary of experience: 1948-74.** *Environ. Health* 84(3): 63-68; 1976. (26 references)

This article is a reprint of an article from *Chemistry and Industry* (London) 13:511-557, 1976, see *Pesticides Abstracts* no. 77-0295.

See also **77-0306** **77-0438** **77-0445** **77-0452** **77-0459**

77-0297. Collins, I. S. (Parramatta Hospital, New South Wales, New Zealand). **Monocytic leukaemia in husband and wife following chronic exposure to chlordane.** *Aust. N. Z. J. Med.* 6(4): 360; 1976.

A 73-year-old woman with a long history of indomethacin treatment for spondylitis was referred because of neutropenia. Moderate splenomegaly, increased monocytes and lymphocytes, and lymphocytic infiltration in a trephine biopsy suggested a diagnosis of chronic monocytic leukemia with coexistent lymphoma. The patient's husband, also 73, had a mild syncopal attack; his blood count showed neutropenia and an increase in monocytes. Physical examination was negative but marrow trephine revealed myelomoncytic leukemia. He denied exposure to chemicals, but it was eventually discovered that he had sprayed the interior of his house frequently with chlordane for the past 13 yr. Adipose chlordane levels were not able to be determined by fat biopsy because of the thrombocytopenia.

77-0298. Anonymous. **Normas para fixacao de tolerancias de residuos de pesticidas em alimentos. [Standards for establisheng tolerances for pesticides residues on foods.]** *Biologico (Sao Paulo)* 40(10): 301-304; 1974. (Portuguese)

The National Commission on Stardards and Codes for Foods of the Brazilian Ministry of Health in its Resolution no. 12/1974 defined the concepts employed in relation to pesticides and their toxicity and established criteria for pesticide tolerances. Data which must be supplied for establishing tolerances for new pesticides and extending the uses of currently permitted pesticides cover analytical methods, application data, persistence studies, and biological data. The latter include acute LD50 values (oral and dermal), subacute and chronic toxicity, reproduction tests, neurotoxicity tests, and biotransformation and metabolism studies.

77-0299. Kaye, S. (Dep. Leg. Med. Pharmacol., Univ. Puerto Rico, San Juan, PR). **Poisoning in children.** *Bol. As. Med. Puerto Rico* 68(3): 47-52; 1976. (18 references)

Until 1972 parathion was the most common cause of poisoning deaths in Puerto Rico. In 1972 alcohol superseded parathion as the leading cause of death by poison overdose. Aspirin has not caused deaths of children in Puerto Rico as frequently as in the United States as a whole. Greater caution in the use of pesticides in Puerto Rico has reduced the risks. Poison control centers have been established at the district medical centers in Rio Piedras, Ponce, Mayaguez, Aguadilla, Arecibo, and Fajardo; addresses and telephone numbers are listed. Symptoms and signs are listed along with the substances which most commonly cause them.

77-0300. Call, D. J.; Shave, H. J.; Binger, H. C.; Bergeland, M. E.; Ammann, B. D.; Worman, J. J. (Dept. Chem., South Dakota State Univ., Brookings, SD 57006). **DDE poisoning in wild great blue heron.** *Bull. Environ. Contam. Toxicol.* 16(3): 310-313; 1976. (15 references)

An adult great blue heron (*Ardea herodias*) in moribund condition was collected in northeastern South Dakota and necropsied shortly after death. The bird was dehydrated and emaciated and its gastrointestinal tract was empty. High levels of *p,p'*-DDE were found in the brain and liver (246 and 570 ppm, respectively). This, coupled with the fact that the bird had tremors before death, suggested that DDE poisoning was an important factor in the death. Available evidence indicates that DDE may have a lingering effect upon both mortality and reproductive success in certain birds.

77-0301. Dennis, W. H., Jr.; Cooper, W. J. (U. S. Army Med. Bioeng. Res. Develop. Lab., Fort Detrick, Frederick, MD 21701). **Catalytic dechlorination of organochlorine compounds. II. Heptachlor and chlordane.** *Bull. Environ. Contam. Toxicol.* 16(4): 425-530; 1976. (4 references)

As part of a study on chemical degradation of pesticides and pesticide formulations a catalytic dechlorination method using nickel boride was applied to heptachlor and chlordane. The pesticides were dissolved in alcohol, then nickel chloride in methanol and aqueous sodium borohydride were added to generate nickel boride in situ. After 30 min of reaction an excess of water was added and the organic product was extracted with benzene/hexane (1:1). The major dechlorination product for both heptachlor and chlordane was a pentachloro derivative. The amount of chloride ion produced in the dechlorination of heptachlor depends on the solvent and the amount of sodium borohydride added. No totally dechlorinated heptachlor was found in the product mixture, but some tetrachloro compound was found. The product distribution for chlordane was similar to that for heptachlor.

77-0302. Lamberton, J. G.; Thomson, P. A.; Witt, J. M.; Deinzer, M. L. (Environ. Health Sci. Cent., Dep. Agric. Chem., Oregon State Univ., Corvallis, OR 97331). **Pesticide container decontamination by aqueous wash procedures.** *Bull. Environ. Contam. Toxicol.* 16(5): 528-535; 1976. (16 references)

"Empty" pesticide containers may still contain considerable quantities of active ingredient, and therefore present a hazard for disposal. Solubility of the formulation in the cleaning agent is a criterion for removal efficiency. Rinsings may be added to the spray tank so disposal of rinse water will not become a problem. Thirty and fifty-five gallon used pesticide barrels were processed by the standard method at a barrel reclaiming company. The barrels had contained carbaryl, 2,4-D, 2,4,5-T phorate, disulfoton, and chlordane. In addition to determining pesticide levels in the wash water, pieces were also cut from the barrel (a wedge including side, bottom, and chime) and extracted with solvent on a steam bath. The greater pes-

ticide amounts were removed when both detergent and water triple rinsing and the standard plant process were employed. Removals in excess of 95% were obtained for phorate, disulfoton, 2,4,5-T low volume ester, 2,4-D, carbaryl, and malathion. Removal of chlordane was less efficient, as would be expected in view of organochlorines' low solubility in water. Triple rinsing by the applicator can reduce the hazard of pesticide containers but does not represent an ultimate solution.

77-0303. Al-Damluji, S. F. (Dep. Med., Coll. Med., Univ. Baghad, Baghad, Iraq). **Organomercury poisoning in Iraq: history prior to the 1971-72 outbreak.** *Bull. WHO 53(suppl.):* 11-13; 1976. (8 references)

Mercury has been used medically in the Middle East since time immemorial. Organomercury compounds were first used as seed dressings in Iraq in 1955. During the years 1955-59, 200 cases of poisoning occurred. A more clearly defined outbreak occurred in 1960, involving approximately 1000 hospital admissions. Twelve patients from two families affected in this outbreak were reexamined in 1973, and showed considerable improvement. (Author abstract by permission)

77-0304. Al-Tikriti, K.; Al-Mufti, A. W. (Dep. Pub. Health, Univ. Baghdad, Baghdad, Iraq). **An outbreak of organomercury poisoning in Iraq. I. Incidence in a defined area and relationship to the eating of contaminated bread.** *Bull. WHO 53(suppl.):* 23-36; 1976. (3 references)

An outbreak of organomercury poisoning due to the consumption of treated grain by farmers and their families occurred in Iraq in 1971-72. A total of 6530 cases were admitted to hospital and of these 459 died. However, there were many more with minor symptoms of poisoning who consulted outpatient departments. This outbreak constituted the largest poisoning epidemic ever recorded. No age was exempt and no pronounced sex difference was apparent. The latent period of up to 60 days between dosage and the onset of symptoms was probably the major factor contributing to the size of the epidemic. Measures taken to limit the outbreak are outlined. (Author abstract by permission)

77-0305. Al-Mufti, A. W.; Copplestone, J. F.; Kazantzis, G.; Mahmoud, R. M.; Majid, M. A. (Dir.-Gen. Sci. Affairs, Min. Health, Baghdad, Iraq). **Epidemiology of organomercury poisoning in Iraq. II. Clinical findings.** **WHO** 53(suppl.) 23-36; 1976. (3 references)

A survey was carried out in a defined area in rural Iraq where there had been many cases of organomercury poisoning following the consumption of bread contaminated by mercury, in order to determine the true incidence of the disorder. The results were compared with those obtained from a similar rural area from which few cases had been reported. A questionnaire was used to determine the amount of contaminated bread eaten and the frequency of symptoms; a simple clinical examination was performed and blood and hair samples were collected for estimation of total mercury concentration. Of 700 people over the age of 5 years in the high-exposure area, 66% admitted to having eaten contaminated bread, while none of the 864 persons in the low exposure area had done so. The mean period during which contaminated bread was eaten was 32 days, but some people had eaten it for as long as 3 months. A mean of 121 loaves was eaten, the maximum being 480 loaves. For the mean number of loaves the intake of methylmercury was likely to have been between 80 mg and 250 mg, but the people who had consumed the largest amount of contaminated bread may have ingested up to 1000 mg of methylmercury over a 3-month period. Of those with signs of alkylmercury poisoning at the time of the survey, 80% had eaten more than 100 loaves, and 53 (71%) out of 75 persons who had eaten more than 200 loaves showed some evidence of poisoning. The incidence rate for poisoning was estimated at 271 per 1000; this figure includes a mortality rate of 59 per 1000, 32 per 1000 cases with severe disability, 41 per 1000 cases with mild or moderate disability and 138 per 1000 cases with only subjective evidence of poisoning at the time of the study. (Author abstract by permission)

77-0306. Kazantzis, G.; Al-Mufti, A.; Al-Jawad, A.; Al-Shahwani, Y.; Majid, M. A.; Mahmoud, R. M.; Soufi, M.; Tawfiq, K.; Ibrahim, M. A.; Dabagh, H. (Middlesex Hosp. Med. Sch., London, England). **Epidemiology of organomercury poisoning in Iraq. II. Relationship of mercury levels in blood and hair to exposure and to clinical findings.** *Bull. WHO* 53(suppl.): 37-48; 1976. (4 references)

In the survey described by Al-Mufti et al. (see preceding article) blood and hair samples were analyzed for total mercury by modified atomic absorption spectrophotometry. The hair samples were divided into 2.5-cm segments and analyzed consecutively. The mean blood levels were 34 ng/ml and 7 ng/ml, respectively in those who had and those who had not eaten contaminated bread. Corresponding mean maximum hair mercury values were 136 μg/g and 5 μg/g, respectively. Hair mercury values provided a better discrimination between different categories of exposure than blood mercury values at the time the survey was performed, some months after the end of the outbreak. Those persons who had not eaten contaminated bread but who lived in the area of high exposure had hair mercury values between the values of those who had eaten and those who had not eaten contaminated bread and who lived in the area of low exposure. Sequential estimation of mercury in 2.5-cm segments of hair in women gave information on the period of accumulation of mercury more than 1 year before the time of collection of the samples. It was possible to show an approximate relationship between the maximum hair mercury value and the amount of contaminated bread eaten. The match between the blood mercury level and the severity of poisoning was poor, owing to the length of time that had elapsed between the onset of poisoning and the sampling. With hair mercury, while the group results showed a good relation to the severity of poisoning, in individual cases the match was

less good, especially in those persons where an insufficient length of hair was available for analysis. Biological variation in sensitivity to methylmercury was also likely to have been an important factor. (Author abstract by permission)

77-0307. Kazantzis, G.; Al-Mufti, A. W.; Copplestone, J. F.; Majid, M. A.; Mahmoud, R. M. (Middlesex Hosp. Med. Sch., London, England). **Epidemiology of organomercury posioning in Iraq. III. Clinical features and their changes with time.** *Bull. WHO* 53(suppl.): 49-57; 1976. (3 references)

Three categories of mercury poisoning were defined in the survey described by Al-Mutfi et al. (Pesticides Abstracts No. 77-0305) and the age-specific incidence rates for these are given. Persons with physical signs consistent with a diagnosis of organomercury poisoning were allocated to categories of severe disability or mild/moderate disability. However, the largest category consisted of persons who had symptoms but no readily elicitable physical signs at the time of the survey. These symptoms followed a consistent pattern with paresthesia involving the lips and/or circumoral region or trunk and difficulty with walking, described as weakness or unsteadiness of the legs, and in some cases repeated falls, forming the most commonly occurring symptom complex. Mean maximum hair mercury levels differentiated this group very clearly from the group with no symptoms of mercury poisoning. Very few people in the area of low exposure complained of such symptoms; where they did occur they were less well related to the time of the outbreak and showed little tendency to improve. Most people reported improvement in their symptoms by the time of the survey, with more improvement in some symptoms than in others. However, it is not known whether those people with symptoms only at the time of the survey had had at an earlier stage mild signs which had cleared. It was thought unlikely that further substantial improvement would occur in those persons with disability at the time of the survey. (Author abstract by permission)

77-0308. Al-Damluji, S. F.; Clin. Comm. Mercury Poisoning. (Dep. Med., Coll. Med., Univ. Baghdad, Baghdad, Iraq). **Intoxication due to alkylmercury-treated seed—1971-72 outbreak in Iraq: clinical aspects.** *Bull. WHO 53(suppl.):* 65-81; 1976. (22 references)

Sixty-six hospitalized patients suffering from chronic methylmercury poisoning were examined in Baghdad during 1972. The poisoning was attributed to consumption of home-made bread prepared from seed wheat treated with mercurial fungicide. The age of incidence ranged between 4 and 70 years. Of the various clinical features encountered, neurological symptoms and signs were predominant and included muscular weakness, numbness, unsteady gait, paresthesia, dysarthria, mental disturbances and, in severe cases, blindness, partial deafness, stupor, coma, and death. Involvement of the cardiovascular, urinary, gastrointestinal and hemopoietic systems, which was commonly encountered in ethylmercury poisoning in the 1960 outbreak in Iraq, was unusual. The severity of symptoms and signs was, broadly speaking, dose-dependent; high exposure led to severe clinical manifestations, but variations existed. Criteria, based on the clinical manifestations, were set for grading the severity of cases. The series included 2 asymptomatic cases, 20 mild, 20 moderate, 14 severe, and 10 very severe. In the latter group 5 patients died from failure of the central nervous system. The severely poisoned patients died irrespective of the medical treatment received. After 2 years of observation, most patients graded as mild or moderate cases lost their symptoms completely. Severe cases improved slowly, although ataxia, diminution of visual field and acuity, and paresthesia were still present. Thus, the previously accepted view that neurological signs were irreversible has been disproved. (Author abstract by permission)

77-0309. Sabelaish, S.; Hilmi, G. (Coll. Med., Univ. Baghdad, Baghdad, Iraq). **Ocular manifestations of mercury poisoning.** *Bull. WHO* 53(suppl.): 83-86; 1976. sl1 One

One hundred patients with organomercury poisoning who were hospitalized in the Medical City, University of Baghdad, were examined ophthalmologically in the period between March and December 1972, and were reviewed again about 10 months later. The examination included clinical signs and symptoms, slit lamp examination of the anterior segment of the eyes, examination for visual field changes and, in the autopsied cases, analysis of the optic nerve and the occipital cortex. In addition, aqueous humour was aspirated in 10 patients and in 10 controls for the estimation of the mercury level. (Author abstract by permission)

77-0310. Bakir, F.; Al-Khalidi, A.; Clarkson, T. W.; Greenwood, R. (Clin. Comm. Mercury Poisoning, Min. Health, Baghdad, Iraq). **Clinical observations on treatment of alkylmercury poisoning in hospital patients.** *Bull. WHO* 53(suppl.): 87-92; 1976.

Twenty-six patients suffering from methylmercury poisoning were treated by different therapeutic regimes. Seven received penicillamine or *N*-acetyl-*d*-*L*-penicillamine, 10 were treated with dimercaprol sulfonate and 9, who could not be treated, were given a placebo and were used as controls. Penicillamine, *N*-acetyl-*d*-*L*-penicillamine, and dimercaprol sulfonate reduced the blood level of mercury and increased its urinary excretion. No appreciable clinical improvement was noticed among the severe or very severe cases, while mild or moderate cases improve clinically irrespective of the treatment given. (Author abstract by permission)

77-0311. Amin-Zaki, L.; Elhassani, S.; Majeed, M. A.; Clarkson, T. W.; Doherty, R. A.; Greenwood, M. R.; Giovanoli-Jakubczak, T. (Med. Coll., Univ. Baghdad,

Baghdad, Iraq). **Perinatal methylmercury poisoning in Iraq.** *Am. J. Dis. Child.* 130(10): 1070-1076; 1976. (16 references)

Mercury levels in blood, hair and milk samples as well as clinical signs and symptoms of methyl mercury poisoning were examined and compared in two infant-mother pairs exposed during the mercury poisoning outbreak in Iraq in 1971-72. One of the infants was born prior to exposure of the mother and therefore was exposed only by ingestion of methylmercury in the mother's milk. In the other pair the mother was exposed during pregnancy; she did not breast feed the infant, who died 30 days after birth. Signs and symptoms of mercury poisoning were apparent in both mothers but not in the infants. Maximum estimated blood mercury levels in the infants were between 500 and 1000 ng/ml, considerably above toxic levels for adults. The average hair-blood mercury ratio was about 250; hair and blood mercury concentrations were closely correlated. Mercury in the maternal milk averaged 8.6% of the simultaneous blood level.

77-0312. Kuruvilla, A.; Bergeson, P. S.; Done, A. K. (Maricopa County Gen. Hosp., Phoenix, AZ). **Arsenic poisoning in childhood: an unusual case report with special notes on therapy with penicillamine.** *Clin. Toxicol.* 8(5): 535-540; 1975. (8 references)

An unusual case of arsenic ingestion involving five children is reported, which involved the process of sublimation. As_2O_3 was inadvertently heated in a charcoal barbecue, and the meat cooked thereon was contaminated. It is possible that the sublimation may have potentiated the toxicity of the usually mildly toxic, relatively insoluble As_2O_3. Penicillamine was used in the latter part of the therapy in three cases after initial dimercaprol, and the clinical effect of penicillamine was particularly dramatic in one case in which dimercaprol discontinuation has been accompanied by recurrent symptoms. Remarks on the mode of action of penicillamine are made. More work needs to be done to establish the possible role of penicillamine in arsenic poisoning. (Author abstract by permission)

77-0313. Kay, K. (Environ. Sci. Lab., Mount Sinai Sch. Med., City Univ. NY, New York, NY). **A brief overview of the toxicological and epidemiological background to the detection and prevention of cancer in agricultural workers.** *Cancer Detect. Prevent.* 1(1): 107-128; 1976. (103 references)

The extent of exposure of the agricultural population to carcinogenic chemicals is indicated by a survey which documents the widespread use of carcinogenic and mutagenic chemicals in agricultural technology. Agricultural workers carry the chemicals home on contaminated clothing and via exhaled air, thus enlarging the population at risk. The carcinogens and mutagens also enter the food produced. Many agricultural chemicals have been detected as carcinogenic in experimental animals but have not been implicated in human cancer. The designing of epidemiologic studies is a complex problem. Chemicals reported as carcinogenic or mutagenic etiological agents used in agriculture include chlorinated hydrocarbons, thioureas, organophosphorus compounds, arsenic, other inorganic compounds, and a group of miscellaneous pesticides including amitrole, piperonyl butoxide, ethyleneimine, bis(2-chloroethyl) ether, 8-hydroxyquinoline, rotenone, captan, simazine, and atrazine. Asbestos, contained in pesticide carriers and agricultural soil, may also present a risk.

77-0314. Anon. **Insecticide blamed for nervous disorders.** *Chem. Eng. News* 54(50): 6; 1976.

Health histories of more than 100 employees who worked in a plant that manufactured leptophos between 1971 and 1975 are being examined following reports that leptophos can cause central nervous system disorders. Some nervous system disorders have been discovered among employees of the plant, but data on numbers of employees examined and on suspect cases are not yet available. The manufacturer retained medical experts upon learning of the occupational health risks and says that no additional incidents have occurred since 1975.

77-0315. Wood, T. E.; Edgar, H.; Salcedo, J. (Dep. Med. Radiol., Univ. Western Ontario, London, Ontario, Canada). **Recovery from inhalation of diquat aerosol.** *Chest* 70(6): 774-775; 1976. (6 references)

The first known case report of poisoning by accidental inhalation of a bipyridilium compound (diquat) aerosol is presented. A 45-year-old man was hospitalized in a confused state with neck stiffness, cough, and fever following four days of illness with myalgia, headache, and cough producing a red, jelly-like sputum. Treatment with tetracycline, erythromycin, or ampicillin plus oxygen therapy produced no improvement, and the sputum culture was negative. X-ray revealed pneumonic consolidation. On the fourth day wet rales were audible over his entire chest, sclerae were slightly icteric, and there was a rash on his left arm. The radiologist recalled seeing the patient spraying weeds and opened diquat packages were found at his home. Oral prednisone therapy was initiated; improvement was rapid. The chest x-rays normalized in 5 days. On recovering the patient stated that he had accidentally sprayed diquat in his face following clogging of the spray nozzle.

77-0316. Takase, H. (Chiba, Japan). [**Important findings on patients recently examined with liver impairment.**] *Chiba Igakkai Zasshi (J. Chiba Med. Assoc.)* 52(4): 151; 1976. (Japanese)

In 12 patients with liver impairment in whom treatment was not effective out of a total of 120 cases of liver impairment, large amounts of organophosphorus derived pesticides were detected in their blood. Although the

only subjective symptom was slight malaise, they showed increased ZTT, decreased cholinesterase activity, and reduction of both RBC and WBC. These changes paralleled the amount of organophosphorus in their blood. The blood pressure was almost in the normal range, and about half of them showed normal levels of urobilinogen. The possibility of their ingesting organophosphorus pesticides via the diet was suggested.

77-0317. Smith, P.; Heath, D. (Univ. Liverpool, Dep. Pathol., Liverpool, England). **Paraquat.** *Crit. Rev. Toxicol.* 4(4): 411-445; 1976. (100 references)

Reports on human and animal toxicity of paraquat are reviewed. Numerous fatalities have been recorded following paraquat ingestion. The course of intoxication is often protracted and there is no known antidote. The pathogenesis of paraquat effects in the lung occurs in two phases:first the destructive phase (lasting 2-7 days) in which destruction of alveolar epithelium is followed by intraalveolar edema, fibrinous exudate, inflammation and formation of eosinophilic hyaline membranes. The second (proliferative) phase entails dissuse fibroblastic tissue proliferation in the alveolar spaces. Death from respiratory failure is the rule. A similar course has been extensively investigated in experimental animals. Paraquat is poorly absorbed from the gut and is rapidly eliminated from the blood stream, but low paraquat levels usually persist in the urine for several days, suggesting paraquat storage in tissues. Selective uptake by the lungs against a concentration gradient has been demonstrated in animals and man. Biochemical findings on the redox reactions of paraquat in the lungs have partially explained the destructive phase of paraquat poisoning but not the proliferative phase. The only clue is that paraquat stimulates growth of fibroblasts when it has been in contact with macrophages. Treatment comprises removal of poison, forced diuresis or hemodialysis, and immunosuppressive or cytotoxic and antifibrotic drugs.

77-0318. Hartig, E. (Miljobeskyttelse Sekt., Industrirad, Copenhagen, Denmark). **En italiensk giftkatastrofe og eftersonningerne i Denmark.** [**An Italian toxin disaster and its repercussions in Denmark.**] *Dansk. Ind.* 10: 18-21; 1976. (Danish)

Following the disaster with dioxin in Seveso it was reasonable that the question concerning the possibility for repetition of the disaster would be raised around the world. The primary facts responsible for the Italian disaster do not exist in Denmark: dioxin (more correctly called TCDD) is not manufactured there, the plant design used would never have been approved in Denmark, and the Danish government keeps a much closer watch on chemical manufacturing. Nevertheless a closer look was taken by the central government and some provincial authorities in Denmark at the safety requirements and disaster plans in relation to chemical disasters. Three principal points of debate included centralization of the disaster prevention facilities, amendment of sec. 85 of the environmental law, and a new law on product control. Section 85 pertains to the obligation for disclosure of all facts affecting the safety of production, with assurance of confidentiality of industrial secrets. The Minister of the Environment has promised to provide Parliament early in 1977 with a review of results from the product control program to date so that any necessary modifications can be undertaken during the writing of the new environmental law during the 1977/78 legislative year.

77-0319. Anonymous. **Sludge incineration.** *Environ. Sci. Technol.* 10(12): 1080-1102; 1976.

In the public mind sewage sludge incinceration has been unjustly associated with municipal refuse incineration and its associated nuisances. Modern fluidized bed and multiple hearth sludge incinerators can be operated without undesirable environmental effects. However, most sludge incinerators installed prior to 1971 lack high-efficiency particulate controls, and the stack emissions may include small quantities of metals, pesticides, and PCB. Very high pesticide destruction efficiencies were found in a study of coincineration with sewage sludge in a multiple-hearth incinerator and pesticide concentrations of 2-5%. The destruction rates exceeced 99.99% for 2,4,5-T, but the PCB destruction rate was only 94%. The more volatile PCB was partially vaporized before it could be oxidized due to the incinerator design used. A new class of incinerators uses the latent heat in the incinerator flue gases to precondition the sludge after it has come from the gravity thickener. This thermal conditioning allows the sludge to be mechanically dewatered to about 40% solids, with the result that these incinerators may have a positive heat balance. Under ideal conditions incineration is more inexpensive than land disposal of sewage sludge.

77-0320. Ghassemi, M.; Quinlivan, S. C.; Day, H. R. (TRW Syst. Energy, Redondo Beach, CA 90278). **Landfills for pesticide waste disposal.** *Environ. Sci. Technol.* 10(13): 1209-1214; 1976.

A great deal of information is available on the engineering aspects of site selection, construction, and operation of landfills for the disposal of pesticides and other hazardous wastes. Comparatively little information has been published on the social, political, economic, and institutional aspects of the establishment and operation of such sites. The latter data are presented for seven existing landfills accepting pesticide wastes in California, Nevada, Idaho, Georgia, and Mississippi. Data includes site location and description, type of operating agency, impetus for site establishment, on-site treatment, disposal method, environmental considerations, untoward incidents, and economic considerations. Community response has generally been favorable or even provided the initiative for startup. In mixed landfills a special area should be reserved for pesticide wastes. Resource recovery involving reconditioning and reuse of rinsed large pesticide containers and shredding of rinsed containers to salvage metals is

environmentally more desirable than container disposal in landfills.

77-0321. Helle, E.; Olsson, M.; Jenson, S. (Dep. Zool., Univ. Oulu, SF-90 100 Oulu, Finland). **PCB levels correlated with pathological changes in seal uteri.** *Ambio* 5(5-6): 261-263; 1976. (12 references)

Carcasses of seals were obtained from hunters in the Gulf of Bothnia in October-November 1975. About 40% of the 109 females of reproductive age collected showed pathological changes of the uterus. Most frequently the uterine horns were closed by stenosis and occlusions, preventing passage from the ovary through the uterine horn. Only 30% of the females were pregnant at the time of collection, which was understandable in view of the uterine abnormalities. The animals with abnormal uteri had significantly higher levels of DDT and PCB related compounds than normal pregnant females. These pathological changes were also found among grey seal from the Baltic area as well as among harbor seal from the Swedish west coast. Therefore PCB is strongly implicated in the reproductive failure of seals from the Baltic area. DDT and PCB levels were significantly (positively) correlated in the males but not in the females. Fetuses contained somewhat lower levels of DDT and PCB than their mothers.

77-0322. Vught, G. (Min. Agric., Paris, France). **Phosphure d'aluminium (emploi en agriculture).** [**Aluminum phosphide:Use in agriculture.**] *Arch. Mal. Prof. Med. Trav. Secur. Soc.* 36(10-11): 688-689; 1976. (1 reference) (French)

According to Article 6 of the Decree of July 11, 1975, aluminum phosphide may be used for grain fumigation only in specialized locations authorized by the Ministry of Agriculture. To attain approval the operators of these sites must submit a detailed plan of the installation and admit inspectors to the premises at least once a year. They should be situated at a sufficient distance from residences and should be enclosed to prevent unauthorized entry. Aeration of the treatment building following treatment is of primary importance; personnel should not be readmitted until the hydrogen phosphide content in the atmosphere is below 0.1 ppm. The containers of aluminum phosphide pellets must be stored carefully under lock and key, and once opened, the entire contents must be used immediately. The availability of a reliable detection system for hydrogen phosphide is indispensable.

77-0323. Rantuccio, F.; Petruzzeleis, V.; Angelini, G.; Scardigno, A. (Clin. Dermatol., Univ. Bari, Bari, Italy). **Patologia cutanea professionale negli addetti ai lavori agricoli.** [**Occupational skin disorders in agricultural workers.**] *G. It. Dermatol. Minerva Dermatol.* 110(8): 416-427; 1975. (125 references) (Italian)

The magnitude of the risk of occupational deermatoses in agricultural workers is difficult to assess. Many of the disorders that occur are trivial, and the cause is not always recognizable. Physical factors are important, e.g., sunlight; 915/2288 subjects with neoplasms in exposed areas were employed in agriculture. Chemical factors include plant juices and agricultural chemicals. Allergic eczematous contact dermatitis was recorded in 101 subjects; 43 of them had a high incidence of positive skin tests with metals and carbamates. Microbial irritants represent the last category of causative factors.

See also **77-0261** **77-0273** **77-0275** **77-0351** **77-0393** **77-0461**

77-0324. Schultz, T. W.; Kennedy, J. R. (Dep. Zool., Univ. Tennessee, Knoxville, TN 37916). **Cytotoxic effects of the herbicide 3-amino-1,2,4-triazole on *Daphnia pulex* (Crustacea:Cladocera).** *Biol. Bull.* 151:370-385; 1976. (37 references)

Static type studies were performed to examine the cytotoxic effects of 3-amino-1,2,4-triazole (amitrole) on *Daphnia pulex*, the common water flea, and to examine its possible modes of entry into the animal. Daphnia specimens 0-24 hr old were exposed to amitrole at 10 ppm and at 24°C until they became immobilized. The most consistent alteration in cell structure was displayed by the mitochondria, especially in the muscle fibers. Identical effects were not seen in all muscle cells within a single animal or all mitochondria within a single cell. Folding of the outer membrane was the most common alteration observed. Membrane folding was accompanied by organelle swelling and a reduction in electron density of the ground matrix and the number of cristae. Other cytotoxic effects observed included general tissue swelling, disarrangement of myofilaments, and dissociation of membranes. Different exposure lengths up to 15 hr resulted in no cell or organelle damage in mobile 0-24 hr old daphnids. Immobilization occurred between 17 hr and 21.5 hr of exposure, and therefore the time of immobility was deduced to be closely related to molt. A delay in ecdysis time is also suggested.

77-0325. Bajgar, J.; Patocka, J. (Purkyne Med. Res. Inst., Hradec Kralove, Czechoslovakia). **Anticholinesterase action of 3-diethylaminophenyl-*N*-methyl-carbamate methiodide in vitro and in vivo.** *Acta Biol. Med. Germ.* 35(3/4): 479-484; 1976. (22 references)

The in vitro inhibition of rat brain acetylcholinesterase and horse plasma butyrylcholinesterase by 3-diethylaminophenyl -*N*- methylcarbamate was investigated. The quaternary carbamate compound inhibits acetylcholinesterase more strongly than butyrylcholinesterase. Without any butyrylcholinesterase inhibition, complete inhibition of acetylcholinesterase may be achieved. In other words, 3-diethylaminophenyl -*N*-methylcarbamate is a selective acetylcholinesterase inhibitor. Increasing inhibition of plasma and liver butyrylcholinesterase and erythrocyte, heart, and diaphragm acetylcholinesterase occurred with increasing carbamate doses, while brain acetylcholinesterase was unaffected. The toxic effects observed for this carbamate were probably due to inhibition of acetylcholinesterase in the central nervous system, and the compound is apparently unable to penetrate the blood-brain barrier.

77-0326. Fusek, J.; Patocka, J. (Purkyne Med. Pes. Inst., 50260 Hradec Kralove, Czechoslovakia). **The effects of some cholinesterase reactivators on contractility of the isolated guinea-pig heart atria.** *Acta Biol. Med. Germ.* 35(3/4): 657-661; 1976. (19 references)

The effect on the isolated guinea pig atrium of eight monoquaternary and bisquaternary pyridine aldoxime cholinesterase reactivators was examined. At concentrations of 0.1 to 10 μM both acetylcholine and methylfurthretonium have negative inotropic effects in electrically stimulated atria and negative chronotropic effects in spontaneously beating atria. Heart muscle contractility parameters are significantly altered in the presence of higher concentrations of cholinesterase reactivators alone. In the presence of reactivators in the concentration range of 0.01 to 1 mM the cumulative dose-response curves of methylfurthrethonium are shifted in parallel to higher concentrations of the agonist.

77-0327. Tscheu-Schlueter, M. (Inst. Wasserwirtsch., Berlin). **Zur akuten Toxizitaet von Herbiziden gegenueber ausgewaehlten Wasserorganismen. Teil 2: Triazinherbizide und Amitrol. [Acute toxicity of herbicides to selected aquatic organisms. Part 2. Triazine herbicides and amitrole.]** *Acta Hydrochim. Hydrobiol.* 4(2): 153-170; 1976. (17 references) (German)

Existing methods for evaluating toxicity to aquatic organisms were refined, especially by adopting two new computer programs for statistical comparison. The test organisms used for six triazines and amitrole were the planktonic green alga *Ankistrodesmus falcatus* (Corda) Rales and the guppy *Poecilia reticulata* Peters. The pesticides tested were highly toxic to the algae (threshold concentration less than 1 mg/l); the triazines acted as strong photosynthesis poisons and amitrole as a general metabolic poison. Among the triazines, toxicity to the algae was correlated with chemical structure. The triazines were highly toxic to the guppy (threshold values < 10 mg/l), while amitrole was less toxic: the TLM48 was 20.3 g/l. Recommended maximum permissible concentrations in receiving streams range from 2 μg/l for desmetryne, ametryne, and prometryne to 191 μg/l for the commercial amitrole formulation Azaplant.

77-0328. Oskarsson, A.; Tjaelve, H. (Dep. Toxicol., Univ. Uppsala, Uppsala, Sweden). **High uptake in the erythrocytes and the spleen of the quaternary dipyridylium salt paraquat injected intravenously in hypotonic solutions.** *Acta Pharmacol. Toxicol.* 39(5): 481-499; 1976. (19 references)

Radiolabeled paraquat, injected intravenously from solutions of low toxicity, was rapidly taken up into the erythrocytes and into the red pulp of the spleen. The splenic uptake is probably due to phagocytosis of paraquat-containing erythrocytes by the reticuloendothelial system. Uptake was much slower from solutions of higher toxicity and following oral, intraperitoneal, and subcutaneous injection. The paraquat present in the erythrocytes was in unmetabolized form, and was not bound to membranes or proteins. Erythrocyte uptake was not affected by changes in pH or by formation of a charge transfer complex with serotonin. Uptake by hemolyzed erythrocyte ghosts was higher than by intact erythrocytes in vitro. The distribution studies also indicated retention of paraquat in the lungs and accumulation of paraquat in tissue melanin.

77-0329. Elo, H.; Ylitalo, P. (Inst. Biomed. Sci., Univ. Tampere, Finland). **Increase in permeability of blood-brain barrier in rats during 2-methyl -4- chloro-phenoxyacetic acid (MCPA) poisoning.** *Acta Physiol. Scand. Suppl.* 440: 85; 1976.

The penetration of ^{14}C-MCPA into cerebrospinal fluid (CSF) and brain tissue was examined in male rats, anesthetized with pentobarbital, during acute and chronic MCPA poisoning. Following a test dose of ^{14}C-MCPA (8 μCi/8mg/kg iv) the radioactivity in brain and CSF of intact animals amounted to 1.5% and 0.3% of that in plasma. During acute severe MCPA poisoning (sodium MPCA, 500 mg/kg sc) the ^{14}C-MCPA levels in brain and CSF were 26.0% and 20.2% of the plasma concentration. Given at as little as 100 mg/kg sc sodium MCPA increased cerebral and CSF MCPA concentrations 2.5- and 8-fold. Corresponding increases in liver and skeletal muscle were 3- and 1.5-fold. During chronic MCPA treatment (sodium MCPA at 500 or 2500 ppm in drinking water) the permeability of the blood-brain barrier for MCPA was only slightly increased, but the penetration into liver was elevated 2-fold. (From author abstract): Abstract No. 112, 15th Scandinavian Congress of Physiology and Pharmacology, Arhus 1976).

77-0330. Marniemi, J.; Parkki, M. G.; Vainio, H. (Univ. Turku Dep. Physiol., Turku, Finland). **Long term effects of a single dose of DDT and PCB on drug activating-inactivating enzymes in rat liver.** *Acta Physiol. Scand. Suppl.* 440: 139; 1976.

The activities of arene oxide forming and arene oxide inactivating enzymes were examined in rat liver after single ip doses of DDT (160 mg/kg) and PCB (50% chlorinated, 100 mg/kg), singly or in combination. Changes in activity were followed for one month. Both DDT and PCB increased the cytochrome P-450 content and the activity of NADPH cytochrome c-reductase, *p*-nitroanisole *O*-demethylase, and benzpyrene hydroxylase in the liver; peak activities appeared 1-2 months after administration. Enhanced activities were also recorded for epoxide hydratase and the drug-conjugation catalyzing enzymes glutathione S-transferase and UDP-glucuronosyltransferase. Highest activities in these cases were found about 2 wk after administration. The activities of epoxide inactivating enzymes were doubled by the single doses. (From author abstracts; abstract no. 217, 15th Scandinavian Congress of Physiology and Pharmacology, Arhus 1976).

77-0331. Ohkawa, H.; Shibaike, Y.; Moridawa, M.; Miyamoto, J. (Res. Dep. Chem. Div., Sumitomo Chem. Co., Ltd., Takarazuka, Hyogo, Japan). **Degradation of the fungicide Denmert (*S-n*-Butyl *S'-p*-tert-butylbenzyl *N*-3-pyridyldithiocarbonimidate, S-1358) by plants, soils and light.** *Agric. Biol. Chem.* 40(5): 943-951; 1976. (6 references)

^{14}C-Denmert (*S-n*-butyl *S'-p-tert*-butylbenzyl *N*-3-pyridyldithiocarbonimidate, S-1358) labeled at the methylene of the benzyl group was gradually decomposed to yield a number of products, when exposed to sunlight on thin-layer plates or in water solution, applied to plant foliage or nutrient solution, and added to soils under upland conditions. The identified products were almost common to plants, soils and light. The primary reactions occurred: (1), oxidation of the sulfur atoms, (2), cleavage of the dithiocarbonimidate linkage, and (3), oxidation of the methylene of the benzyl group. Also, hydroxylation at the *tert*-butyl group attached to the moiety slightly took plant in soils. Although radioactivity was absorbed by the plant through leaves or roots, translocation into other parts of the plant occurred to a very small extent. Denmert and its degradation products were hardly leached through the acidic soils tests. (Author abstract by permission)

77-0332. Ohkawa, J.; Minkami, N.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chem; Co. Ltd., Takarazuka, Hyogo, Japan). **Stereospecific metabolism of *O*-ethyl *O*-2-nitro -5- methylphenyl *N*-isopropyl phosphoramidothioate (S-2571) by liver microsomal mixed function oxidases.** *Agric. Biol. Chem.* 40(10): 2125-2127; 1976. (6 references)

Organophosphorus pesticides undergo various types of metabolic reactions mediated by microsomal mixed function oxidase in animals. The stereospecificity in the oxidation of the racemic, (+)-, and (-) forms of *O*-ethyl *O*-2-nitro -5- methylphenyl *N*-isopropyl phosphoramidothioate was investigated using the compound labeled with ^{3}H on the phenyl protons. Following incubation of the racemic form of ^{3}H-S-2571 with a rabbit liver microsomes plus NADPH system, the major radioactive metabolites detected on TLC were S-2571 oxon, (21% of applied) S-2571-CH_2OH (17%), S-2571-oxon-CH_2OH (15%); recovered S-2571 amounted to 30% of the amount applied. Hydrolysis products were also found to small extents. Thus S-2571 mainly undergoes oxidative desulfuration and hydroxylation at the 5-methyl group with retention of the configuration at the phosphorus atom under these conditions. The metabolites and the recovered S-2571 were all markedly dextrorotatory according to comparison with standards; the recovered S-2571 and S-2571-oxon contained 65% and 69% respectively of the (+)-isomers.

77-0333. Kumarasami, R.; Raghu, K. (Biol. Agric. Div., Bhabha Atomi. Res. Ctr., Bombay 400085, India). **Conversion of the fungicide ziram in rice plants.** *Agric. Biol. Chem.* 40(11): 2297-2298; 1976. (8 references)

^{35}S-labeled ziram (specific activity 1.5 mCi/mole) was sprayed on 25-day-old pot-grown rice seedlings at the rate of 0.5 ppm for each square foot area of plant growth. The extracts prepared after varying lengths of time were compared with standards for the alanine and β-glucoside derivatives of dimethyldithiocarbamic acid (DDC-alanine and DDC-glucoside). DDC-alanine and DDC-glucoside accounted for nearly one third of the radioactivity present

in the plants at the end of 24 hr after spraying. Another 3.8% was detected as TICA, thiazolidine -2- thione -4- carboxylic acid, and 9% as an unidentified divalent sulfur compound. Another 16% remained detectable as ziram (or possibly thiram, or copper or sodium dimethyldithiocarbamate). The metabolic pathway of ziram is probably similar to that for all dialkyldithiocarbamates. About 27-37% of the radioactivity spotted onto the paper chromatograph remained at the origin, and therefore might have been present in sulfur-containing plant metabolites.

77-0334. Kecskes, M.; Schmidt, K. (Res. Inst. Soil Sci. Agric. Chem. Hungar. Acad. Sci., Budapest, Hungary). **A mikroorganizmusok mennyisegi viszonyainak alakulasa TMTD hatasara erdomaradvanyos csernozjom talajban. [Quantitative change of microoorganisms under the influence of TMTD in a chernozem soil with forest residues.]** *Agrokem. Talajtan* 25(1-2): 10-162; 1976. (36 references) (Hungarian)

Photometric and plate count techniques were used to measure the effect of pure tetramethyl thiuram disulfide (TMTD) and commercial grade thiram on the number of microbes, bacteria, ray fungi, and microscopic fungi in chernozem soil incubated at 26-29°C for 2 months. Both compounds stimulated microbe growth at concentrations of 0.1% and above. Both stimulated bacterial reproduction. Both inhibited reproduction of ray fungi; microscopic fungi growth was inhibited by 0.1% and 1.0% concentrations of the fungicides; higher concentrations resulted in an increased growth of yeast.

77-0335. Gopal, T.; Oehme, F. W.; St. Omer, V. (Comp. Toxicol. Lab., Dep. Surg. Med. and Dep. Anat. Physiol., Kansas State Univ., Manhattan, KS). **Influence of dietary protein on the effect on coumaphos and triflupromazine interaction in sheep.** *Amer. J. Vet. Res.* 37(10): 1143-1152; 1976. (36 references)

Groups of sheep were fed either a low-protein or normal-protein diet. Each group was subdivided into quarters and these subgroups administered either 8 mg/kg body weight coumaphos with saline solution; 8 mg/kg coumaphos with 1.1 mg/kg triflupromazine HCL (TFP); 15 mg/kg coumaphos with saline solution; or 15 mg/kg coumaphos with 1.1 mg/kg TFP. The onset of clinical signs, mortality rate, mean survival time, necropsy lesions, and plasma and erythrocyte cholinesterase (ChE) activity were monitored for each subgroup. The inhibition of ChE activity was greater in groups given both drugs. The low-protein diet adversely affected the appearance of clinical signs (all sheep in the low-protein groups developed toxicosis; 4 on the normal diet did not), mortality rate, mean survival time, and ChE activity. The recovery of ChE activity in TFP-treated sheep was faster than in their respective controls; sheep fed a normal protein diet recovered more rapidly than those on the low-protein diet. The inhibition of erythrocyte ChE proved to be a better index of organophosphorus toxicosis than that of plasma ChE.

77-0336. Francis, A. J.; Spanggord, R. J.; Ouchi, G. I.; Bramhall, R.; Bohonos, N. (Stanford Res. Inst., Menlo Park, CA). **Metabolism of DDT analogous by a *Pseudomonas sp.*** *Appl. Environ. Microbiol.* 32(2): 213-216; 1976. (7 references)

The bacterium *Pseudomonas sp.* metabolized diphenylethane to 2-phenylpropionic acid; 1-(p-chlorophenyl) -1- phenylethane to 2-(p-chlorophenyl) propionic acid; 1-(p-chlorophenyl) -1- phenyl-ethane to 2-(p-chlorophenyl) -2- hydroxypropionic acid and atrolatic acid; and diphenyl methane to phenylacetic acid. These results indicate that both aryl-chlorine substitution and alpha-carbon substitution were important in determining biodegradability by *Pseudomonas sp.* Both aromatic and alpha-carbon substituents appear to render DDT inert to aerobic attack by *Pseudomonas sp.* through electron deactivation of the aromatic ring.

77-0337. Hicks, G. F., Jr.; Corner, T. R. (Dep. Microbiol. Public Health, Michigan State Univ., East Lansing, MI). **Distribution and effects of 2,4,5-trichlorophenoxyacetic acid in cells of *Bacillus megaterium*.** *Appl. Microbiol.* 30(6): 959-963; 1976. (15 references)

Cell death in a resting population of an asporogenous *Bacillus megaterium* was accelerated by ambient concentrations of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) equal to or greater than 10 μg/ml or 5 μg/mg of cells (dry weight), but only after prolonged exposure. Conversely, populations of growing cells were not markedly influenced even at 100 μg/ml. Effects on cell respiration were not manifest until the ambient concentration reached 1,000 μg of 2,4,5-T/ml, or 500 μg/mg. Cells of *B. megaterium* did, however, accumulate 2,4,5-T passively to a level approximately twofold above the ambient concentration. Most of the accumulated compound was easily washed from the cells but, of the firmly bound herbicide, about 0.5 μg/mg of cells (dry weight), nearly 60% by weight, was localized in the protoplast membrane. The foregoing results, obtained with a purified preparation of 2,4,5-T were also elicited by 2,4,5-T analytical standards. The extracted contaminants did not produce the results alone nor did they influence the results when present in combination with 2,4,5-T. (Author abstract by permission)

77-0338. Vendrig, J.; Dierickx, P. (K. U. L. Lab. Plant Physiol., Louvain, Belgium). **Some aspects of the mode of action and metabolism of orthonil in plants.** *Arch. Environ. Contam. Toxicol.* 4(4): 395-403; 1976. (12 references)

A study of the physiological behavior of the synthetic compound Orthonil (α-chloro -β- (3-chloro-*o*-tolyl)-propionitrile) revealed a strong auxin activity in higher plants. Otherwise, Orthonil appeared not to be a herbicide-auxin. It is metabolized intensively in plant tissues. Among the identified metabolites, two compounds were detected which also exert a high auxin activity. It is concluded that at least a part of the apparent auxin activity of Orthonil may be due to α-(3-chloro -*o*- tolyl) acetic acid,

one metabolite of Orthonil. Although Orthonil strongly stimulates elongation growth, this growth is not accompanied by a stimulated ethylene evolution as is the case with other auxins. A possible metabolic pathway of Orthonil is discussed. (Author abstract by permission)

77-0339. Tagatz, M. E.; Borthwick, P. W.; Ivey, J. M.; Knight, J. (Gulf Breeze Environ. Res. Lab., Gulf Breeze, FL). **Effects of leached mirex on experimental communities of estuarine animals.** *Arch. Environ. Contam. Toxicol.* 4(4): 435-442; 1976. (11 references)

Experimental communities of varous estuarine animals in outdoor tanks were exposed to a continuous flow of water containing mirex for 10 weeks. The mirex was leached from fire ant bait (0.3% active ingredient) by fresh water which was then mixed with salt water to yield exposure concentrations averaging 0.038 μg/L. The experiment simulated runoff from treated land into estuarine areas. Mortality of grass shrimp (*Palaemonetes vulgaris*), pink shrimp (*Penaeus duorarum*), common mud crabs (*Panopeus herbstii*), and striped hermit crabs (*Clibanarius vittatus*) was significantly higher in tanks containing the toxicant. Mortality of ribbed mussels (*Modiolus demissus*) and American oysters (*Crassostrea virginica*) was significantly lower in treated tanks, probably because numbers of both species of crabs, which ate the bivalves, were reduced. Sheepshead minnows (*Cyprinodon variegatus*) were least affected by mirex. Almost all deaths occurred after 10 or more days of exposure. All exposed animals accumulated mirex, with maximum concentrations ranging from 5,500X (pink shrimp) to 73,700X (soft tissues of oysters) above the concentration in the water. Sand substratum contained mirex up to 1,500X that in the water. The study demonstrated that mirex can be leached from bait by fresh water and concentrated by and affect survival of members in an experimental estuarine community. (Author abstract by permission)

77-0340. Lee, P. W.; Fukuto, T. R. (Dep. Entomol., Div. Toxicol. Physiol., Univ., California Riverside, CA). **Penetration and comparative metabolism of leptophos in susceptible and resistant houseflies.** *Arch. Environ. Contam. Toxicol.* 4(4): 443-455; 1976. (10 references)

The metabolism and rate of penetration of leptophos (*O*-methyl *O*-4-bromo-2,5- dichlorophenyl phenylphosphonothioate) was determined in a susceptible strain and a strain of houseflies which was 50-fold resistant to leptophos. Penetration of leptophos into resistant flies was substantially slower than into susceptible flies but large differences in metabolism, both quantitatively and qualitatively, were not observed. No difference was observed in the sensitivity of flyhead and thorax acetylcholinesterase to leptophos-oxon *in vitro*, and tolerance to leptophos by the resistant strain is explained in terms of decreased rates of penetration and minor differences in metabolism. (Author abstract by permission)

77-0341. Davison, K. L.; Mollenhauer, H. H.; Younger, R. L. (U. S. Dep. Agric., Agric. Res. Serv. Metab. Radiat. Res. Lab., Fargo, ND). **Mirex-induced hepatic changes in chickens, Japanese quail, and rats.** *Arch. Environ. Contam. Toxicol.* 4(4): 469-482; 1976. (28 references)

Mirex was fed in the diet to chickens at 0 to 160 ppm for 12 and 16 weeks, to Japanese quail at 0 to 80 ppm for 12 weeks, and to rats at 0 to 100 ppm for 2 and 4 weeks. Mirex did not affect the concentration of protein or cytochrome P450 in hepatic microsomes of chickens or Japanese quail, nor did it affect hydroxylation of aniline or demethylation of aminopyrine. However, structural changes were apparent in livers of chickens fed mirex at 10 ppm and above and included regions of necrosis and nonspecific cellular aberrations and alterations of sinusoids and bile canaliculi. Mirex caused liver enlargement in rats and increased microsomal protein and cytochrome P450 but did not affect hydroxylation of aniline or demethylation of aminopyrine. Hepatic structural changes in rats that were associated with mirex included proliferation of smooth endoplasmic reticulum and degeneration of some bile canaliculi. (Author abstract by permission)

77-0342. Niedner, R.; von Oettingen, U. (Inst. Pharmakol. Toxikol. TU, Braunschweig, Germany). **Influence of herbicides on parathion toxicity.** *Naunyn Schmiedebergs Arch. Pharmacol.* 294: R25; 1976.

A greater than additive effect on lethal dose (LD50 469.5 mg/kg b.w.) was found for the combined administration of chlorbufam (LD50 1,313.5 mg/kg b.w. when given alone) and parathion (LD50 10.3 mg/kg b.w. when given alone) to NMRI mice. Chlorbufam increased mouse AChE activity, but when chlorbufam was given with parathion, there was a stronger decrease of AChE activity than was caused by parathion alone. Chlorbufam with paraoxon showed the same effect. An AChE inhibition caused by administration of combined parathion and paraoxon was reduced by the application of 40 mg/kg b.w. chlorbufam for 8 days. Lenacil similarly reduced the inhibiting effect of parathion, but had no effect on that induced by paraoxon.

77-0343. Abou-Donia, M. B. (Dep. Physiol. Pharmacol., Duke Univ. Med. Cent., Durham, NC). **Pharmacokinetics of a neurotoxic oral dose of leptophos in hens.** *Arch. Toxicol.* 36(2): 103-110; 1976. (16 references)

A pharmacokinetic profile of [^{14}C] leptophos was determined in laying hens following a single oral dose of 400 mg/kg (0.58 μCi). Most of the radioactivity was excreted into the urine and feces. After 15 days, the total radioactivity recovered in the combined urinary-fecal excretion was 73.5% of the administered dose. A major part of the absorbed leptophos was concentrated in the eggs. The total ^{14}C radioactivity in egg albumen was 7.29% of the administered dose as compared to 4.67% in egg yolk. The half-life for the disappearance of radioactivity from the birds' bodies following the administration of [^{14}C] leptophos was 11.55 days. A correlation between the

pharmacokinetics of leptophos and the susceptibility of the hen to delayed neurotoxicity was found. (Author abstract by permission)

77-0344. Ackermann, H.; Seidler, H.; Kagan, Yu. S.; Voronina, V. M. (Akad. Wiss. DDR, Forschungszent. Molekularbiol. Med. Zentralinst. Ernaehrung, Potsdam-Rehbruecke, DDR). **Metabolic and toxic behavior of phthalimide derivatives I. Fate of imidan in the fetus.** *Arch. Toxicol.* 36(2): 127-137; 1976. (21 references)

The organophosphate insecticide imidan (phosmet) includes a phthalimide group. Because of the structural relationship to the teratogenic compound thalidomide, its placental transfer and metabolic fate in rats was studied. Its passage to embryonic tissues was confirmed. After intraamniotic injection to the first amniotic cavity of the left uteri, a distribution of imidan and 32P compounds throughout the uteri, the concentration depending upon the incubation time and the distances from the place of injection was established. The half-life of imidan, detected in the exteriorized fetuses or in newborns, was 50—70 min. Imidoxon, i.e., the oxidized form of imidan, has a diminished half-life. This fact explains the presence of imidoxon only in small concentrations after application of imidan. (Author abstract by permission)

77-0345. Faff, J.; Borkowska, G.; Bak, W. (Mil. Inst. Hyg. Epidemiol., Warsaw, Poland). **Therapeutic effects of some cholinolytics in organophosphate intoxications.** *Arch. Toxicol.* 36(2): 139-146; 1976. (9 references)

The therapeutic effects of pipethanate (sycotrol) and two newly synthetized cholinolytics, DPX-8 and ANC-51, were compared with atropine in mice poisoned by DDVP (dichlorvos), fluostigmine, phospholine, and paraoxon. The antagonistic activity of tested drugs against acetylcholine-induced contraction of rat ileum and oxotremorine-induced salivation and tremor in the mouse was also studied. The anticholinergic activity of pipethanate, DPX-8, and ANC-51 was weaker than that of atropine. However, the therapeutic effect of pipethanate was higher than that of atropine in mice poisoned by the organophosphates. DPX-8 and ANC-51 afforded a better antidotal effect than atropine only in DDVP-poisoned mice. (Author abstract by permission)

77-0346. Beasley, J. N.; Patterson, L. T.; Templeton, G. E.; Smith, R. J., Jr. (U. S. Dep. Agric., Stuttgart, AR 72160). **Response of laboratory animals to a fungus used as a biological herbicide.** *Arkansas Farm Res.* 24(6): 16; 1975.

Preliminary experiments were performed to provide data for the proposed registration and commercial use of *Colletotrichum gloeosporioides* f. sp. *aeschynomene* against northern jointvetch in rice. No adverse effects were seen in oral toxicity tests wherein rats and mice were feed for one week on a spore cake consisting of 50% spores and 50% corn starch or given a single oral dose equivalent to 1500 ml spore slurry/70 kg human. No eye irritation was produced within one week after treatment when three drops of an aqueous suspension containing 2 million spores per ml was placed in the eyes of white rabbits. When four weanling rats were placed in a closed 4-liter container and sprayed with 5 ml of an aqueous spore suspension containing 8 million spores per ml, then observed for 14 days and weighed weekly, no abnormalities were observed. Attempts to reisolate the fungus from macerated lung tissue were unsuccessful. No macroscopic or microscopic abnormalities were observed following subcutaneous injection of 1.5 million spores in an aqueous suspension in rats. Lack of mycotoxin production was evidenced when the fungus was cultured on brown rice for three weeks at room temperature, then the rice mixed with standard diet to make a ration containing 25% molded rice.

77-0347. Sharkey, M. J.; Hodge, R. W.; Davis, I. F.; Bogdanovic, B. (Dep. Agric., Werribee, Victoria, Australia). **Some effects of formaldehyde treatment of hay or silage and level of barley intake on the production of crossbred lambs fed in pens.** *Aust. J. Exper. Agric. Anim. Husb.* 16(81): 452-457; 1976. (16 references)

In vivo digestibility studies were performed on hay and silage treated with formaldehyde in comparison to untreated hay and silage. In growth studies these forages were fed with and without barley to 6-month-old crossbred lambs in 20 treatment groups (four forage types offered ad lib combined with five barley levels of 0-500 g/day). The sheep were fed silage for 6 wk or hay for 12 wk, then slaughtered. On a digested matter basis the barley contributed 0-76% of the digested energy intake. Lamb growth rates were above 100 g/day when barley constituted 60-70% of the digested dry matter. Silage and hay alone with digestibilities of 62-65% barley maintained sheep liveweights. Treating the forage with formaldehyde did not significantly increase intake or growth rate.

77-0348. Von Witsch, H.; Munz, A.; Scheibe, C. (Bot. Inst., Tech. Univ. Muenchen, Weihenstephan, Germany). **Lichtabhaengige DDT-Wirkung bein Mikroalgen. [Light-dependent effect of DDT on microalgae.]** *Ber. Dtsch. Bot. Ges.* 88(2): 191-196; 1975. (9 references) (German)

Effects of external factors on the growth of the algae *Microcystis aeruginosa* and *Coelastrum proboscideum* in culture were measured via the dry weight increase (mg/100 ml). An excess of DDT (10 ppm) dissolved in isopropyl alcohol was added to the cultures following an initial intense light shock (50,000-80,000 lux for 0.5-2 hr). The high light energy alone brought about a great growth depression in the case of *Microcystis aeruginosa*, and the sensitivity of DDT increased with increasing light exposure. *Coelastrum proboscideum* was largely insensitive to light radiation as well as to the combined treatment with light and DDT.

77-0349. Kopecek, K.; Fuelier, F.; Ratzmann, W.; Simonis, W. (Bot. Inst. Univ. Wuerzburg). **Lichtabhaengige Insektizidwirkungen auf einzellige Algen. [The light dependent effect of insecticides on unicellular algae.]** *Ber. Deutsch. Bot. Ges.* 88(2): 269-281; 1976. (20 references) (German)

Ankistrodesmus braunii and *Anacystis nidulans* were exposed to sevin (carbaryl), lindane, and dieldrin in concentrations from 0.1 to 100 ppm; reactions were measured under illumination and in darkness. The synchronization of *Ankistrodesmus* cultures was disturbed by all three insecticides. Chlorophyll content, dry weight, photosynthetic capacity, and the formation of autospheres were reduced by all three compounds. Lindane above 10 ppm decreased pigment content, dry weight, and cell number of *Anacystis* under illumination. Low lindane concentrations stimulated photosynthesis and dark respiration; higher concentrations inhibited these processes, but only under illumination. Light grown cells showed a higher lindane accumulation than those grown in darkness.

77-0350. Knauf, W. (Ekol. Lab., Pflanzenschutzforsch., Hoechst AG, Frankfurt am Main, Germany). **Geraete zur Durchfuehrung toxikologischer Langzeitstudien an Wasserorganismen. [Apparatus for performing long-term toxicologic studies on water organisms.]** *Arch. Fischereiwiss.* 26(3): 103-108; 1975. (13 references) (German)

Two types of flow-through apparatus were developed for performing dynamic tests with water organisms, and experience gained with this apparatus is described. In the first type a certain quantity of a highly concentrated solution, emulsion, or suspension of the substance under examination is continuously mixed with a known volume of flowing water, then pumped through the test chamber. With this type of apparatus the concentration of the test substance can be varied as desired, possibly to simulate naturally occurring conditions. Adjustment of dilutions may be troublesome. Photometric calibration prior to use and periodically thereafter is advised, as is replacement of stretched or squeezed tubing every few days. An apparatus was also built which operates according to the serial dilution principle, using the largest possible number of standardized components and the simplest possible construction. The water level was maintained with a flotation valve. Solution was siphoned from one test beaker, mixed with an equal volume of water, then passed into the next beaker to produce the dilution. series. Only one pump is needed for adding the stock concentration. Brief interruptions of pump operation are not disastrous in this system However, errors in one concentration are perpetuated in this system.

77-0351. Herfs, W.; Franz, J. M. (Biol. Bundesanst. Land-Forstwirtsch., Inst. Pflanzenschutzm. Prfg., Braunschweig, Germany). **Pruefung der Auswirkungen von Pflanzenschutzmitteln auf Nutzarthropoden und deren Einbeziehung in die Zulassung. [Tests of the effects of pesticides on beneficial arthropods and their inclusion in the approval process.]** *Anz. Schaedlingskde. Pflanzensch. Umweltsch.* 48(12): 177-179; 1975. (11 references) (German)

Systematic studies of the side effects of pesticides on beneficial (entomophagous) arthropods were initiated by a German working group (directed by the Federal Biological Institute or Biologische Bundesanstalt) in 1970. An international working group was established on this topic in 1974. The work is currently directed toward developing standardized tests which will first be employed on a voluntary basis, then added to the required registration data. The official testing of the effects of pesticides on benecicial arthropods was included in the registration procedure in Germany as of Oct. 1, 1975. At first three common and important species (*Trichogramma* sp., *Coccygomimus turionellae*, and *Phygaeudon fumator*) will be tested in the laboratory, and one field test has been developed which will survey the fauna in apple trees. International cooperation has been stressed throughout the period of test development.

77-0352. Romanovskaya, O. I.; Straume, O. (Inst. Biol., Latvian Acad. Sci., Riga, USSR). **O sposobnosti sornykh rastenii k detoksikatsii gerbitsida fenazona. [Ability of weeds to detoxify the herbicide fenazon.]** *Agrokhimiya* 5: 117-124; 1975. (29 references) (Russian)

Most of the fourteen species of monocotyledonous and dicotyledonous weeds examined were able to detoxify fenazon. The metabolic intensity varies greatly and is closely linked with the magnitude of fenazon uptake and tissue distribution. Partial detoxication of fenazon may be accomplished by binding of the herbicide molecule in an inactive *N*-glycoside complex. In soil it appears that the herbicidal effects of fenazon are subject to intense degradative activity, e.g., due to uptake by crops, leaching into the impermeable zone, and transformation to inactive compounds.

77-0353. Filipova, N. V. (All-Union Res. Inst. Fertil. Land Manage., Moscow, USSR). **Vliyaniye mineral'nogo pitaniya na dinamiki linuron v rasteniyakh morkovi. [Effects of mineral nutrition on the dynamics of linuron in carrots.]** *Agrokhimiya* 13(6): 100-104; 1976. (8 references) (Russian)

The variations in quantities of linuron in the vegetation and roots of carrots were studied under various mineral nutrition conditions. In the variant without externally supplied nitrogen and especially potassium the herbicide breakdown in the plant was considerably retarded. When suitable amounts of potassium and nitrogen were supplied the rate of linuron detoxication in the tissues of the carrot plant was accelerated.

77-0354. Smith, L. L.; Lock, E. A.; Rose, M. S. (Biochem. Med. Unit, Imp. Chem. Ind. Ltd., Cent. To-

xicol. Labs., North Macclesfield, Cheshire, England). **The relationship between 5-hydroxytryptamine and paraquat accumulation into rat lung.** *Biochem. Pharmacol.* 25(22): 2485-2487; 1976. (14 references)

The uptake of 5-hydroxytryptamine (5HT) into rat lung slices was shown to obey saturation kinetics and to be inhibited by imipramine metabolic inhibitors and a sodium-free medium. The apparent *Km* for the uptake process was found to be 3.3 μM with a Vmax of 6 nmoles/g wet wt/min. Lung slices taken from rats given a dose of paraquat known to damage type I and type II lung epithelial cells showed inhibition of paraquat uptake but no inhibition of 5HT uptake. This together with the stimulation of paraquat accumulation into rat lung slices in a sodium-free medium leads to the conclusion that the uptake of paraquat and 5HT into the lung does not occur in the same cell type. (Author abstract by permission)

77-0355. Crabtree, H. C.; Rose, M. S. (Biochem. Mech. Unit. Imp. Chem. Ind. Ltd., Cent. Toxicol. Lab., North Macclesfield, Cheshire, England). **Early effects of diquat on plasma corticosteroid concentrations in rats.** *Biochem. Pharmacol.* 25(22): 2465-2468; 1976. (16 references)

Plasma corticosteroid concentrations were significantly elevated 15 min after intraperitoneal (i.p.) injection of 90 μmoles of diquat/kg body wt (LD_{50} dose) into phenobarbitone anesthetised rats. Similar effects were noted after subcutaneous dosing but after oral administration there was a delay of approximately 1 hr before significantly elevated concentrations were observed. The magnitude of the increase after i.p. administration of diquat was dose-related up to 26 μmoles/kg body wt, as was the duration of the response. The increase in plasma corticosteroid concentration in diquat-treated rats could be prevented by pretreating animals with dexamethasone which also reduced adrenocorticotrophic hormone (ACTH) concentration in these animals. Experiments *in vivo* and *in vitro* indicated that diquat did not increase the steroidogenic response of adrenals to ACTH. It is concluded that the increased adrenal steroid synthesis observed at early times after diquat adminstration is caused by release of ACTH from the pituitary. (Author abstract by permission)

77-0356. Lee, P. W.; Allahyari, R.; Fukuto, T. R. (Dep. Entomol., Univ. California, Riverside, CA 92502). **Stereospecificity in the metabolism of the chiral isomers of fonofos by mouse liver microsomal mixed function oxidase.** *Biochem. Pharmacol.* 25(23): 2671-2674; 1976. (9 references)

Metabolic conversion of phosphorothioate triesters to the corresponding phosphate esters is a well known activation reaction in animals and plants. The absolute configuration of fonofos isomers was established by x-ray analysis of the corresponding *p*-bromo analog of fonofos and related to fonofos by chemical correlation. ^{35}S-labeled fonofos enantiomers were prepared, and after incubation with the mouse liver microsome suspension for 2 hr, the radiolabeled materials were extracted into ether with an efficiency of 95%. The P=S to P=O activation of the resolved isomers of fonofos took place with greater than 70% retention of configuration at the phosphorus center. In addition to the oxons other ^{35}S-labeled materials isolated were diphenyl disulfide, diphenyl disulfide oxide, and unmetabolized fonofos. The stereochemical course of the reaction is thus consistent with a mechanism proposed for oxidative desulfuration in which initial attack by oxygen on the thiono sulfur is postulated. Inversion, which occurs to the extent of 20-30%, probably proceeds with initial attack of oxygen on the phosphorus atom, followed by elimination of sulfur.

77-0357. Sarasin, A.; Meunier-Rotival, M. (Inst. Rech. Sci. Cancer, Villejuif, France). **How chemicals may induce cancer.** *Biomedicine* 24(5): 306-316; 1976. (95 references)

Recent studies in chemical carcinogenesis are reviewed. Almost all carcinogens require activation by metabolic processing in order to operate in vitro or in vivo. Some chemicals and drugs induce the enzymes which metabolize carcinogens. Such induction seems to occupy a fundamental position in relation to the development of human cancer due to environmental pollution. Almost all of the cellular DNA lesions provoked by chemical carcinogens can be repaired by a DNA repair system. Mutations can be caused by failure to repair some lesions or by the action of "error prone" repair. A rapid screening test for carcinogenicity is afforded by the mutagenic actions of some chemicals. A great variety of such tests has been presented to date. An overall scheme for the possible action mechanisms of chemical carcinogens is outlined. DDT is cited as an inducing factor which can enhance the effects of polycyclic hydrocarbons on metabolizing enzymes.

77-0358. Badaeva, L. N. (All-Union Res. Inst. Hyg. Toxicol. Pestic., Polym. Plast., Kiev, USSR). **Vliyanie polikhlorkamfena na nekotorye organiy i ikh nervnye apparat u beremennykh zhivotrykh.** [**The effect of polychlorocamphene on some organs and their nervous apparatus in pregnant animals.**] *Byull. Eksp. Biol. Med.* 82(8): 945-847; 1976. (7 references) (Russian)

Polychlorocamphene (toxaphene) administered orally to pregnant albino rats producted destructive structural and enzymatic changes in the cerebral cortex, heart, uterus, and spinal cord. The number of cholinesterase (CE)-positive pericellular structures decreased markedly, although their activity continued. Thin-layer chromatography showed accumulation of polychlorocamphene in the heart, uterus, and brain of the mothers and in the organs of the fetuses.

77-0359. Mirkova, E.; Yanev, S. (Inst. Hyg. Nutr., Med. Acad., Sofia, Bulgaria). **On certain changes in the excitabil-**

ity of the central nervous system of a generation of rats treated antenatally with basfungin. *Dokl. Bolg. Akad. Nauk* 29(8): 1227-1229; 1976. (6 references)

The first and second generation descendents of rats that were administered Basfungin (methylmethion) in doses from 1/50 LD50 to 1/200 LD50 showed a dose-dependent decrease in central nervous system function, measured as the reaction time required to jump from a jar full of water. Female rats were treated with Basfungin at 1/50 LD50 (62.5 mg/kg), 1/100 LD50 (31.25 mg/kg), 1/200 LD50 (15.62 mg/kg) and 1/400 LD50 (7.81 mg/kg) through the entire 20 days of gestation. Reaction times lower than those of control groups were found at relatively high confidence levels ($p < 0.02$ - $p < 0.001$) for female progeny in the three highest dose groups in both generations, and for male progeny in the two highest dose groups in both generations except for those of the first generation in the 15.62 mg/kg group, and those of the second generation in the 16.52 and 31.25 mg/kg groups. Reduction of reaction time was more pronounced in the first of the two generations tested.

77-0360. Liedtke, M. A.; Gier, H. T.; Meloan, C. E. (Dep. Chem., Kansas State Univ., Manhattan, KS). **Effects of dietary DDT on blood plasma levels of calcium and magnesium in laboratory rats.** *Bull. Environ. Contam. Toxicol.* 16(4): 379-382; 1976. (14 references)

Rats were fed either 18 or 37.5 mg/day DDT. Evidence of nervous disorder was noted, and calcium and magnesium ions (in terms of both total and non-protein-bound or ultrafiltrable levels) were measured in blood plasma, to test the theory that DDT inhibits the nerve enzyme adenosine triphosphatase by reducing the level of the ions upon which its operation depends. Tremors were observed in all rats on the 37.5 mg/day regimen; these animals had mean plasma total-Mg levels of 23 ppm, significantly higher than the controls (19 ppm), a finding inconsistent with the expectation of tremors accompanied by lower Mg levels. Mean total calcium levels rose for both the 18 mg/day group (123 ppm) and the 37.5 mg/day group (119 ppm), compared to the control (113 ppm), but the Ca level was lower (107 ppm) for an "acute" group showing tremors less than 24 hours after onset of the DDT diet; the subsequent rise of Ca levels accompanied by reduced tremors is consistent with the theory. No significant changes were found in levels of non-protein-bound (ultrafiltrable) ions of Ca and Mg for any group.

77-0361. Edwards, C. A. (Rothamsted Exp. Stn., Harpenden, Hertfordshire, England). **The uptake of two organophosphorus insecticides by slugs.** *Bull. Environ. Contam. Toxicol.* 16(4): 406-410; 1976. (11 references)

Slugs (chiefly *Agriolimax reticulatus*) were collected from experimentally controlled plots of spring wheat to which 8 kg/ha of either diazinon spray or phorate granules had been applied. The phorate treatment caused a 90% mortality; slug mortality in plots receiving diazinon spray was not significantly higher than that of control plots. Phorate soil levels went from 4 ppm to zero within 8 weeks; the maximum level of phorate residue found in slugs during this period was about 4 ppm. Diazinon levels in soil went from 4 ppm to zero in about 12 weeks; the maximum residue found in slugs was nearly 200 ppm.

77-0362. McLeese, D. W. (Dep. Environ., Fish. Mar. Serv., Biol. Stn., St. Andrews, New Brunswick, Canada). **Fenitrothion activity to the freshwater crayfish, *Orconectes limosus*.** *Bull. Environ. Contam. Toxicol.* 16(4): 411-416; 1976. (10 references)

Crayfish were exposed to 1, 5, and 10 ppb fenitrothion for 7 days in a laboratory apparatus that simulated the water exchange of a stream. A second group was exposed to constant concentrations of 0.01-100 ppb for 168-240 hours, without water exchange. Times to 50% mortality (LT50) were established by probit analysis; lethal thresholds were interpolated from plots of percentage mortality against concentration. There were no deaths in the first group. The LT50 in the second group at 10 ppb was 100 hours for small crayfish; no large crayfish had died by 240 hours. At 32-100 ppb the LT50 was 19-24.5 hours for small and 60-75 hours for large crayfish. The 96-hour LC50 was about 10 ppb for small and 30 ppb for large crayfish. The lethal threshold was 4 ppb for small and 20 ppb for large crayfish.

77-0363. Hill, E. F.; Heath, R. G.; Williams, J. D. (U. S. Fish Wildlife Serv., Patuxent Wild. Res. Cent., Laurel, MD). **Effect of dieldrin and Aroclor 1242 on Japanese quail eggshell thickness.** *Bull. Environ. Contam. Toxicol.* 16(4): 445-453; 1976. (28 references)

Six-month-old continuously laying Japanese quail hens were fed Aroclor 1242 at a dietary concentration of 10 ppm for 45 days. A second, subdivided group was fed dieldrin at 1, 3, and 9 ppm for 75 days. The shells of eggs laid by the Aroclor group averaged 4.7% (the first egg) and 5.2% (the first 5 eggs) less thick than those of a control group. The egg shells of the dieldrin group was not significantly less thick than those of a control.

77-0364. St. John, L. E.; Lisk, D. J. (Pestic. Res. Lab., Dep. Food Sci., New York State Coll. Agric., Cornell Univ., Ithaca, NY). **A feeding study with captan fungicide in the dairy cow.** *Bull. Environ. Contam. Toxicol.* 16(4): 474-476; 1976. (4 references)

Residues of intact captan were not found in the milk or urine of a Holstein cow that was fed the pure fungicide at the 5 ppm level (based on a daily ration of 22.7 kg) for 4 days. Captan may have been retained in body tissues or excreted in manure intact or in urine or manure as a metabolite. Captan was added to and recovered from control samples of milk and urine to determine limits of detection: 0.01 ppm and and 0.1 ppm for milk and urine, respectively.

77-0365. Schaper, R. A.; Crowder, L. A. (Dep. Entomol., Univ. Arizona, Tucson, AZ). **Uptake of ^{36}Cl-toxaphene in mosquito fish, *Gambusia affinis*.** *Bull. Environ. Contam. Toxicol.* 15(5): 581-587; 1976. (5 references)

The uptake of ^{36}Cl-toxaphene by *Gambusia affinis* from suspensions containing 2 ppm increased linearly from 0.1 to more than 0.5 μg/g fish for hourly samples taken during an 8-hour exposure period. Fish exposed to the 8-hour regimen were placed in untreated water for 8 hours; there was no significant evidence of excretion of chloride, and there was minimal metabolic alteration of the toxicant during the 8 hours. Five stages of toxic response were determined by observing the behavior of fish placed for more than 10 hours in water containing 2 ppm ^{36}Cl-toxaphene, and the average body load of toxicant and TR residues was determined for each stage. Effects ranged from a tendency to swim abnormally (perpendicularly to the side of the container) at body loads as low as 0.42 μg/gm fish, found after 5 hours of exposure, to sinking to the bottom with rapidly ventilating gill movements at 0.75 μg/gm fish after 12 hours of exposure, to death when the average uptake was 0.68 μg/gm fish after 8 hours.

77-0366. Saxena, S. C.; Karel, A. K. (Toxicol. Lab., Dep. Zool., Univ. Rajasthan, Jaipur, India). **On effects of chlordane on the blood glucose and of glucose administration on the acute chlordane toxicity in *Meriones hurrianae* Jerdon, the Indian desert gerbil.** *Bull. Environ. Contam. Toxicol.* 15(5): 593-600; 1976. (16 references)

Adult male gerbils injected intramuscularly with 25, 50, and 75 mg/kg body weight chlordane developed acute hyperglycemia, with blood glucose levels initially as high as 170, 190, and 210 mg/100 ml (compared to about 115 mg/100 ml in controls). Gerbils given 25 mg/kg body weight chlordane were administered orally 2 g/kg body weight glucose solution; an elevation of blood glucose levels confirmed a decrease in glucose tolerance due to chlordane.

77-0367. Vance, B. D.; Maki, A. W. (Dep. Biol. Sci., North Texas State Univ., Denton, TX). **Bioconcentration of Dibrom by *Stigeoclonium pachydermum*.** *Bull. Environ. Contam. Toxicol.* 15(5): 601-607; 1976. (18 references)

An LD100 curve was obtained for cultures of the algae *Stigeoclonium pachydermum* inoculated with Dibrom (naled) to a final concentration of 0, 0.1, 1, 10, 20, 30, and 50 μg/ml. Growth was measured daily for 6 days following inoculation; growth inhibition was directly related to Dibrom concentration (concentrations above 20 μg/ml were required to inhibit growth). Dibrom residues were recovered from cell fractions of 6-day-old cultures of *S. pachydermum* incubated in 1,000 μg/ml Dibrom for 45 minutes. Recoveries were: 72.80% from cell walls; 0.22% from cellular material; and 0.06% from the culture medium (with about 26.9% assumed hydrolyzed). The high fraction of Dibrom found in cell walls, coupled with microscopic observation of a thick amorphous coating on the algal filaments and an absence of characteristic apical setae in Dibrom-treated cultures, suggests a chemical reaction between Dibrom and the cell walls, during which the pesticide is rapidly degraded.

77-0368. Nelson, J. H.; Stoneburner, D. L.; Evans, E. S.; Pennington, N. E.; Meisch, M. V. (U. S. Army Environ. Hyg. Agency, Aberdeen Proving Ground, MD). **Diatom diversity as a function of insecticidal treatment with a controlled-release formulation of chlorpyrifos.** *Bull. Environ. Contam. Toxicol.* 15(5): 630-634; 1976. (5 references)

Test rice plots were treated with a formulation of 10.6% chlorpyrifos so as to obtain 0.25, 0.5, 1.0, and 2.0 ppm in water. Bacillariophycaceae were sampled in situ 6 and 12 weeks after treatment; microscopic estimates of community diversity were statistically analyzed to obtain indications of significant toxicity. No substantial diversity difference was evident in treated and control plots at the 4 concentration levels of chlorpyrifos after 6 weeks. After 12 weeks, significant decreases in diversity occurred in treated plots, directly proportional to chlorpyrifos concentration. Mean diversity indices were 0.389, 0.286, 0.258, 0.041, and 0.774 for 0,25 ppm, 0.50 ppm, 1.0 ppm, 2.0 ppm, and control plots, respectively.

77-0369. Cook, G. H.; Moore, J. C.; Coppage, D. L. (U. S. Environ. Protection Agency, Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561). **The relationship of malathion and its metabolites to fish poisoning.** *Bull. Environ. Contam. Toxicol.* 16(3): 283-290; 1976. (23 references)

Pinfish (*Lagodon rhomboides*) were exposed to 20, 30, or 75 μg malathion per liter of flowing sea water. Only small concentrations of malathion and malaoxon were found in the body tissues after 24 hr of exposure to 75 μg malathion/liter, but all tissues contained malathion monoacid and diacid. The accumulation of monoacid in the gut after exposure to 30 μg/l corresponded to the phosphorylation of acetylcholinesterase in the brain and to the percentage mortality in the fish population. Exposure of fish to lower malathion concentrations (20 μg/) resulted in less brain acetylcholinesterase inhibition and lower monoacid residues in the gut. Monoacid concentrations decreased sharply after exposure was discontinued but brain acetylcholinesterase remained inhibited. Monoacid residues in the gut concomitant with brain acetylcholinesterase inhibition should confirm malathion as a cause of poisoning in fish. However, monoacid and diacid residues in the gut are probably not causally related to poisoning.

77-0370. Geike, F.; Parasher, C. D. (Inst. Nichtparasitaere Pflanzenkrankh. Biol., Bundesanst. Land- Forstwirtsch., Berlin-Dahlem, Germany). **Effect of hexachlorobenzene (HCB) on growth of *Tetrahymena pyriformis*.** *Bull. Environ. Contam. Toxicol.* 16(3): 347-354; 1976. (20 references)

Hexachlorobenzene (HCB) (0.001, 0.01, 0.1, 0.25,

and 0.5 ppm) in 5% acetone was added to cultures of *Tetrahymena pyriformis*, which were then grown for 10 days at 30 C. Incubation of the cultures with HCB led to a decrease in growth and to an increase in the excretion of "porphobilinogen" into the medium. The effects were dose related. The total nitrogen and carbohydrate concentrations were greatly reduced by HCB, whereas the dry matter content was reduced to a lesser extent.

77-0371. Ludke, J. L. (U. S. Fish Wildlife Serv., Patuxent Wildlife Res. Cent., Laurel, MD 20811). **Organochlorine pesticide residues associated with mortality: additivity of chlordane and endrin.** *Bull. Environ. Contam. Toxicol.* 16(3): 253-260; 1976. (14 references)

Male and female bobwhite quail (*Colinus virginianus*) were treated with 10 ppm chlordane or 10 ppm endrin for 10 wk, or were given 10 ppm chlordane for 10 wk followed by 10 ppm endrin for 10 wk. The pesticides were incorporated into the diet. The birds were sacrificed after 9-10 days on clean food. Mortality and weight loss occurred only in the groups fed endrin alone or endrin with chlordane. The carcasses of moribund birds had low lipid contents, indicating advanced symptoms of intoxication. Concurrent with fat mobilization, brain residues of endrin were elevated. Individuals that survived exposure to endrin alone or chlordane plus endrin had lower brain endrin residues than birds that died, and birds treated with chlordane plus endrin had higher brain chlordane residues than birds treated with chlordane alone. Birds treated with endrin alone had no brain chlordane residues. Dead and moribund quail treated with endrin plus chlordane had significantly lower brain residues than dead and moribund birds treated with endrin alone.

77-0372. O'Neill, P. M.; Langlois, B. E. (Dept. Anim. Sci., Fd. Sci. Sect., Univ. Kentucky, Lexington, KY 40506). **Effect of heptachlor on the growth, viability and respiration of *Staphylococcus aureus*.** *Bull. Environ. Contam. Toxicol.* 16(3): 330-338; 1976. (23 references)

Alcohol or alcoholic heptachlor solution (3 or 5 ppm) was added to broth cultures of *Staphylococcus aureus* in the exponential phase of growth. The lag phase in the growth of the cultures was increased from 12 to 24 hr when the concentration of heptachlor was increased from 3 to 5 ppm. The lag phase in the controls was 3 to 4 hr. Compared with controls, cell size increased approximately 20% and 28% when 3 and 5 ppm heptachlor were added to the cultures. The greatest increase in size occurred 2 hr after the addition of pesticide. The dry matter of the cells increased with cell size. Initial exposure of *S. aureus* cells to heptachlor resulted in leakage of some UV light absorbing cellular materials (265 mμ) into the growth medium; leakage continued for 1-2 hr. Heptachlor also caused an increase in the rate of respiration of the organisms during growth.

77-0373. Wochok, Z. S.; Welch, T. (Dept. Biol., Univ. Alabama, University, AL 35486). **Carbaryl effects on growth and development in suspension cultures of wild carrot.** *Bull. Environ. Contam. Toxicol.* 16(3): 325-329; 1976. (10 references)

Carbaryl and 1-naphthol in 5% acetone were added to stock liquid cultures of wild carrot (*Daucus carota*). Growth of the cultured carrot tissues was inhibited to 67% and 33% of control values by 20 and 10 ppm carbaryl, respectively. The specific activities of RNA and protein increased with increasing pesticide concentrations, although the total protein was reduced to 60% of control in the presence of 20 ppm carbaryl. Embryo development was reduced by 85% in 20 ppm carbaryl and teratogenic effects were observed in embryos that did develop. When carrot tissues were incubated in labeled carbaryl (10 ppm) for 14 days, all but 0.5-1% of the label was found in the medium and cell washes, suggesting that very little of the compound was incorporated by the carrot cells. About 91% of the carbaryl appeared to break down to 1-naphthol. 1-Naphthol produced the same inhibitory effects on growth in this system as did carbaryl, suggesting that the 1-naphthol residue of carbaryl is itself a potent inhibitor of tissue growth and development.

77-0374. Jackson, G. A. (Southeast. Fish. Cult. Lab., Marion, AL). **Biologic half-life of endrin in channel catfish tissues.** *Bull. Environ. Contam. Toxicol.* 16(5): 505-507; 1976. (3 references)

Catfish were fed a diet of 2.5 μg/g dry weight endrin (3% body weight/day) for 147 days, at which time endrin levels in the whole fish, liver, kidney, gastrointestinal tract, and remaining carcass were 0.49, 0.19, 1.53, 1.09, and 0.63 μg/g, respectively. After 44 days on a noncontaminated diet, endrin was undetectable in the kidney and liver and 0.05, 0.04, and 0.03 μg/g in the gastrointestinal tract, remaining carcass, and whole fish samples, respectively. Tissue samples at 17, 30, and 44 days into the uncontaminated regimen revealed average biologic half-lives for endrin of 12, 10, 10, 11, and 15 days for the whole fish, liver, kidney, gastrointestinal tract, and remaining carcass samples, respectively.

77-0375. Zitko, V.; McLeese, D. W.; Carson, W. G.; Welch, H. E. (Environ. Can. Biol. Stn., St. Andrews, New Brunswick, Canada). **Toxicity of alkyldinitrophenols to some aquatic organisms.** *Bull. Environ. Contam. Toxicol.* 16(5): 508-515; 1976. (21 references)

The lethal threshold of six 2-alkyl-4,6-dinitrophenols (dinitrophenol, dinitrocresol, dinoseb, binapacryl, dinosam, and dinocap) to juvenile Atlantic salmon ranged from 0.70 mg/l to 0.02 mg/l, and increased with increasing octanol-water partition coefficient; toxicity to crayfish and lobsters was also determined for these six compounds, and the relationship between toxicity and octanol-water partition coefficient was used to predict toxicity for 12 additional dinitrophenols. The lethal

threshold to lobster larvae of Dinoseb was 0.0075 mg/l; the adult lobster threshold was 0.3 mg/l; crayfish survived much higher levels of exposure (1 mg/l for 215 hr; 10 mg/l for 144 hr).

77-0376. Yadav, D. V.; Pillai, M. K. K.; Agarwal, H. C. (Dep. Zool., Univ. Delhi, Delhi, India). **Uptake and metabolism of DDT and lindane by the earthworm, *Pheretima posthuma*.** *Bull. Environ. Contam. Toxicol.* 16(5): 541-545; 1976. (6 references)

Lindane and DDT were measured in worms 24 hours, then weekly for 10 weeks after the worms were placed in earth containing 1 ppm lindane, 1 ppm DDT, or both 1 ppm lindane and 1 ppm DDT. The DDT uptake was 6.5 ppm at 24 hours, 11.4 ppm after 1 week, with a peak of 18 ppm at 9 weeks. In the presence of lindane, initial uptake of DDT was less, and reached a peak of 11.6 ppm at 8 weeks. The lindane uptake for lindane by itself peaked at only 1.1 ppm at 5 weeks after a gradual increase; it was less in the presence of DDT, peaking at 0.98 ppm after 5 weeks. The DDT metabolites *p,p'*-DDE and *p,p'*-DDD were detected; the DDE:DDD:DDT ratios after 1, 5, and 9 weeks were 58:21:21, 38.8:34:37.2, and 24.4:21.7:53.9, respectively; DDD and DDE together accounted for 79 and 73% of the total pesticide measured at 1 and 5 weeks, respectively. In the presence of lindane, the DDE:DDD:DDT ratios at 3, 6, and 8 weeks were 42.8:36.2:21, 50:32.2:17.8, and 40.5:36.2:23.3, respectively; the metabolites were 79, 82, and 76.7% of the DDT at the corresponding periods. Lindane appeared not to have been metabolized.

77-0377. Kato, Y.; Odanaka, Y.; Teramoto, S.; Matano, O. (Inst. Environ. Toxicol., Tokyo, Japan). **Metabolic fate of ethylenethiourea in pregnant rats.** *Bull. Environ. Contam. Toxicol.* 16(5): 546-555; 1976. (13 references)

Female Wistar rats were administered 100 mg/kg body weight ^{14}C-ETU (^{14}c-ethylenethiourea) on the 12th day of gestation; 4,5-^{14}C-ETU and 2-^{14}C-ETU were measured in feces, urine, exhaled air, organs and tissues, and fetuses. Fetuses contained about 0.220, 0.163, and 0.014 μmole ^{14}C-ETU/g tissue 2, 6, and 24 hours after administration, respectively, values in line with those found in all other tissues except the thyroid gland, which accumulated greater amounts. One-third of the radioactive carbon from 4,5-^{14}C-ETU was found in the fetus protein fraction 24 hours after administration; after 2 and 4 days, most of the remaining carbon was in the protein fraction (this finding was not duplicated when 2-^{14}C-ETU was used as the tracer). Most of the total ETU was eliminated rapidly in urine: 12% after 3 hours, about 80% after 24 hours. The 4,5-^{14}C-ETU was found in breath soon after administration and for 192 hours thereafter, but only traces of 2-^{14}C-ETU were found, suggesting that the fragmentation of the imidazolidine ring of ETU and the decarboxylation of four and/or five carbon atoms of ETU occurred as ETU was metabolized to carbon dioxide.

77-0378. Dobson, R. C.; Baugh, E. R. (Dep. Entomol., Univ. Farms Dep., Purdue Univ., Lafayette, IN). **Dieldrin residue removal from the fat of swine.** *Bull. Environ. Contam. Toxicol.* 16(5): 567-571; 1976. (4 references)

Pigs were raised for 14 months on a diet containing 10 ppm dieldrin by weight, then divided into 5 experimental groups fed phenobarbital (8.5 g/100 lb feed, plus 3.4 lb charcoal/100 lb feed); phenobarbital (8.5 g/100 lb feed, without charcoal); charcoal (3.4 lb/100 lb feed); nitroanisole (135.9 g/100 lb feed); and phenothiazine (45.3 g/100 lb feed) for about 6 weeks, to determine whether these diets might detoxify dieldrin-containing fat. Phenobarbital treatments with and without charcoal reduced the mean dieldrin residue in kidney plate and belly fat to 0.72 and 0.40 ppm, respectively, compared to a control mean of 3.19 ppm after 6 weeks of detoxification. The other experimental regimens were less effective. A similarly designed experiment was conducted with the following 5 treatment diets: phenobarbital (8.5 g/100 lb feed); phenobarbital (same) with phenothiazine (45.3 g/100 lb feed); and phenothiazine (27.6, 45.3, and 90.6 g/100 lb feed). The mean dieldrin residue in fat was 0.44 and 0.46 ppm (compared to 3.85 ppm for a control) for the respective phenobarbital regimens; the other diets were much less effective.

77-0379. Beatty, P. A.; Holscher, M. A.; Neal, R. A. (Vanderbilt Univ. Sch. Med., Dep. Biochem., Nashville, TN). **Toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in larval and adult forms of *Rana catesbeiana*.** *Bull. Environ. Contam. Toxicol.* 16(5): 578-581; 1976. (5 references)

Bullfrog tadpoles were administered intraperitoneally 0, 25, 50, 100, 200, and 1,000 μg/kg body weight 2,3,7,8-tetrachloridibenzo-*p*-dioxin (TCDD); the percentages surviving on the 50th day after injection were 80, 87, 73, 93, 80 and 80% for the respective dosage groups. Adult bull frogs were injected i.p. with 0, 50, 100, 250, and 500 μg/kg body weight TCDD; after 35 days there was no mortality in any group, and histopathological examination of liver, kidney, lung, heart, and gonads revealed no significant lesions.

77-0380. Degraeve, N.; Moutschen-Dahmen, M.; Houbrechts, N.; Colizzi, A. (Lab. Genet., Univ. Liege, Liege, Belgium). **A propose des risques d'un insecticide: le carbaryl utilise seul et en combinaison avec les nitrites. [Risk presented by an insecticide: carbaryl used alone and in combination with nitrites.]** *Bull. Soc. Roy. Sci. Liege* 45(1-2): 46-57; 1976. (33 references) (French)

The insecticide carbaryl caused colchico-ploid cells and tissue degradation in experimental animals. The effect of carbaryl on *Nigella* cells was enhanced by the addition of nitrate, possibly due to the formation of nitroso-carbaryl. Carbaryl produced an increased frequency of abnormal (especially acrosomeless) spermatozoa in mice; it did not affect bone marrow or cause testicular degeneration.

77-0381. Al-Fulluji, N.; Makkawi, T. A.; Abou-El-Azm, I. M.; Sokkar, I. M.; Darraji, M. (Coll. Vet. Med., Baghdad Univ., Baghdad, Iraq). **Experimental studies on organomercury poisoning in chickens in Iraq.** *Bull. WHO (Suppl.)* 53: 119-21; 1976. (17 references)

For 164 days mature chickens received a daily diet containing 40 g of wheat treated with organomercurial fungicide and 80 g of untreated diet. A control group received 120 g of normal diet daily. The experimental group was then split - half receiving the same diet for a further 155 days, by which time all had been killed or had died, the other half being fed the same diet as the controls. No cases of mercurialism were seen in the experimental group, although 2 died after 143 and 319 days respectively. Egg production fluctuated as between the groups. Mercury levels in egg albumin showed high peaks after 98 and 108 days. After the feeding of contaminated wheat had been discontinued the albumin mercury level did not fall consistently below 0.5 mg/kg for 127 days. Levels in egg yolk always remained below the level in wheat and dropped to zero 49 days after feeding of the dressed wheat had been discontinued. Mercury levels found in tissue were similar to those described by other authors. Levels in the edible parts of the single cock examined exceeded those in the hens. Implications of these findings for public health decisions on the use of chicken and eggs as food when the birds have had access to contaminated grain are discussed. (Author abstract by permission)

77-0382. Newberne, P. M. (Dep. Nutr. Food Sci., Massachusetts Inst. Technol., Cambridge, MA 02139). **Environmental modifiers of susceptibility to carcinogenesis.** *Cancer Detect. Prevent.* 1(1): 129-173; 1976. (117 references)

Environmental factors that influence the susceptibility of indivuduals have been examined as a first step toward cancer prevention. Some of the factors identified to date are reviewed. Epidemiologic studies and animal experimentation have clearly indicated that drugs and chemicals may be important factors acting to alter the individual and his response to environmental carcinogens. Dietary modification is a promising means of altering patterns of cancer morbidity and mortality. However, low level ingestion of some compounds is practically inevitable because of their wide distribution and persistence in the environment. This is particularly true for the chlorinated hydrocarbon pesticides. They have been demonstrated to induce liver enzymes which metabolize foreign compounds. Much more information is needed on their cancer-promoting or possibly cancer-preventing effects before policy decisions are made.

77-0383. Schulte-Hermann, R. (Inst. Toxikol. Pharmacol., Philipps-Univ., Marburg a.d. Lahn, Germany). **Two-stage control of cell proliferation induced in rat liver by α-hexachlorcyclohexane.** *Cancer Res.* 37(1): 166-171; 1977. (37 references)

Alpha-hexachlorocyclohexane (α-BHC) was used to stimulate cell proliferation and examine the timing of DNA synthesis in rat liver. The increase in DNA synthesis starts after a lag phase (prereplicative phase) of at least 20 hr following α-BHC administration. A second determinant, food consumption, was demonstrated by using animals adapted to a controlled feeding and lighting schedule. Initiation of DNA synthesis is suppressed by fasting or protein deprivation and returns 5-8 hr after readministration of a protein-containing diet, whereas light-dark rhythm has no effect on the timing of DNA synthesis. The first signal for hepatic DNA synthesis therefore seems to be provided by α-BHC administration and the second in the sequence by protein intake. In the absence of the second signal committed cells are arrested at a critical point of the prereplicative state and accumulate. Protein intake permits release from the block and after completing the remaining 5-8 hr to the prereplicative phase the accumulated cells enter the S period. The observations presented offer a means of synchronizing a proliferating population of hepatocytes in the living animal. They also afford an explanation for the diurnal rhythmicity in the rate of hepatic cell proliferation.

77-0384. Romancik, V. E. (Min. Sci. Tech. SSR, Bratislava, Czechoslovakia). **Hygienicko-toxikologicke aspekty vyrovy burexu a jeho medziproduktov. I. Sledovanie ucinkov kyseliny mukochlorovej na organizmus. [Hygienic-toxicological aspects in the manufacture of Burex and its intermediates. II. Observation of the effects of mucochloric acid on the organism.]** *Cesk. Hyg.* 21(6-7): 319-325; 1976. (9 references) (Czech)

Mucochloric acid is an intermediate in the production of burex (pyrazon). Mucochloric acid (MCA) applied at 0.03 g/kg and 0.006 g/kg is toxic to human skin and is known to decrease the metabolic production of plasma proteins and MP1 and MP2 acidic alpha-mucoproteins, and to increase SGPT and LDH activity. The principal effects are fully in evidence 4 days after administration of the compound.

77-0385. Jenssen, D.; Renberg, L. (Div. Genet., Natl. Swed. Environ. Protect. Bd., Environ. Toxicol. Unit. Wallenburg Lab., Stockholm, Sweden). **Distribution and cytogenetic test of 2,4-D and 2,4,5-T phenoxyacetic acids in mouse blood tissues.** *Chem. Biol. Interact.* 14(384): 291-299; 1976. (25 references)

Cytogenetic effects of 2,4-D and 2,4,5-T were investigated by means of induced micronuclei in mouse bone marrow erythrocytes. This represents a particularly effective test system for detecting weak chromosome breaking activity in erythrocytes because of its high experimental resolving power. The concentrations of test substances reaching the target cells were analyzed to supplement the cytogenetic tests. The cytogenetic tests 24 hr and 7 days after treatment with 2,4-D or 2,4,5-T showed no detectable increase in erythrocyte micronuclei compared to controls. A weak toxic effect of 2,4-D and 2,4,5-T on mitotic activity

was indicated by decreased percentages of polychromatic erythrocytes. Less than 5% of the test substances present in the plasma appeared in the cells, as indicated by gas chromatographic analysis of blood and bone marrow plasma and cell fractions. This finding is in agreement with the known rapid excretion of phenoxyacetic acids from the mammalian body.

77-0386. Price, N. R. (Dep. Biol. Sci., Lancaster Univ., Lancaster, England). **The effect of two insecticides on the Ca2+ + Mg2+ -activated ATPase of the sarcoplasmic reticulum of the flounder, *Platichthys flesus*.** *Comp. Biochem. Physiol.* 55(2C): 91-94; 1976. (19 references)

The organochlorine compound DDT and the organophosphate parathion were found to have an inhibitory effect on the $Ca^{2}+ + Mg^{2}+$ ATPase of flounder muscle sarcoplasmic reticulum. Time course enzyme experiments were carried out in reaction medium containing (per ml), 50 μmoles Tris-HCl, pH 7.5, 100 μmoles KCl, 5 μmoles $MgCl_2$, 50 n-moles $CaCl_2$, 2 μmoles ATP, and 50 μg protein. DDT or parathion were added to 10 ml of reaction medium in small vols of acetone ranging from 5 to 50 μl. Controls contained the same vol of acetone. The reaction was performed at 20°C, and 1 ml samples were withdrawn at 3 min intervals. The effect on the enzyme is discussed in the light of the known ability of the compounds to disrupt excitation-contraction coupling and to induce contraction in skeletal muscle. (Author abstract by permission, supplemented)

77-0387. Graf, G.; Guttman, S.; Barrett, G. (Dep. Zool. Miami Univ., Oxford, OH). **The effects of an insecticide stress on genetic composition and population dynamics of a population of feral *Mus musculus*.** *Comp. Biochem. Physiol.* 55(2C): 103-110; 1976. (34 references)

A feral population of *Mus musculus* was placed in 8 quarter-acre enclosures, equally divided into test and control grids; treated mice were exposed to a total of 8.8 kg of the carbamate insecticide Sevin (carbaryl). Chi-square values indicated no significant allele frequency changes in serum esterase loci ES-2 and ES-5 between pre-and post-spray populations. The mean number of captures per trapping data showed that test populations were significantly larger but fluctuated more than those in control grids; percent survival was slightly better in test grids. Significant differences in population growth or genetic variation of *Mus musculus* cannot be attributed to the application of Sevin. (Author abstract by permission)

77-0388. Licht, L. E. (Dep. Biol., York Univ., Downsview, Ontario, Canada). **Postmetamorphic retention of C^{14} DDT by wood frog tadpoles.** *Comp. Biochem. Physiol.* 55(2C): 119-121; 1976. (10 references)

Rana sylvatica tadpoles were treated with either 0.001 or 0.003 ppm ^{14}C-DDT and after metamorphosis isolated tissues from the young frogs were examined for DDT content. DDT-treated tadpoles retained the chemical after transformation. Heart, head, gut, and lungs contained only trace quantities of DDT, but the liver and fat concentrated high levels, as much as 60 ppm for fat. Newly transformed frogs, which had been treated with DDT as tadpoles, lost DDT much more slowly while living a terrestrial existence than did tadpoles still living an aquatic life. (Author abstract by permission)

77-0389. Ishikawa, T. T.; Shaw, S.; Steiner, P. M.; Mellies, M.; Richardson, G.; Glueck, C. J. (Gen. Clin. Res. Ctr., Coll. Med., Univ. Cincinnati, Cincinnati, OH). **Selective elevation of high density lipoprotein cholesterol by chlorinated hydrocarbons.** *Clin. Res.* 24: 257A; 1976.

The effects of chlorinated hydrocarbon compounds were examined on plasma cholesterol related components to identify compounds which would selectively elevate high density protein cholesterol (C-HDL), an antiatherosclerotic lipoprotein. The organochlorine compounds were injected at 40 mg/kg (except for lindane, which was given at 12 mg/kg) in corn oil to male rats weighing 300 g, 8 for each substance. Test substances were pentachlorodiphenyl, dienochlor, HCB, dieldrin, camphechlor, dicofol, lindane, chlordecone, chlorobenzilate, and tetradifon. Only pentachlorodiphenyl, dieldrin, and chlordecone elevated C-HDL by 32%, 25%, and 23% respectively. Mean cholesterol levels were also raised by pentachlorodiphenyl and dieldrin (17 and 11%), but not significantly by dicofol (6%). Triglyceride levels in animals treated with these three compounds were significantly lower than in controls.

77-0390. Hicks, G. Fisher (Michigan State Univ., East Lansing, MI). **Distribution and effects of DDT and 2,4,5-T in *Bacillus megaterium*.** *Diss. Abstr. Int. B* 36(9): 4313; 1976.

The water insoluble insecticide DDT and 2,4,5-T, a water soluble herbicide, exerted similar effects on cells of *Bacillus megaterium*. The viability of cells in nonnutritive media was reduced after several hr exposure to 10 μg/ml (5 μg/mg cell dry weight) of either pesticide. Respiration was not affected by either pesticide at 100 μg/ml. Growth was affected only at 100 μg 2,4,5-T/ml. A small amount of DDT was degraded to a structurally similar compound, DDT, but no other degradation products were evident. Each pesticide partitioned into viable cells which retained 175 μg DDT or 0.5 μg 2,4,5-T/100 mg of cells (dry weight). About 75% of the accumulated DDT or 60% of the accumulated 2,4,5-T was sequestered by the limiting membrane. The DDT retained in the membrane represented about 2% of the membrane dry weight. Chemical analyses indicated that DDT but not 2,4,5-T replaced membrane lipids. After about 1.5 hr exposure, DDT and the generated DDD were slowly eluted from the cells but DDD was eluted at a faster rate. The eluted DDT also became much more gravitationally stable in aqueous media, as measured by centrifugation characteristics, probably due to its association with

membranes or other cellular material. These elution patterns explain how DDT can enter and move through lower trophic levels. Residual 2,4,5-T in cells was not eluted but remained associated with cells and membranes even after the viability of the cell population was reduced. Thus it appears that the limiting membrane is a major site of interaction of these pesticides with bacteria. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 76-5570).

77-0391. Morel, N. M. L. (Univ. Southern California, Los Angeles, CA). **Action of DDT on two clones of a marine green alga *Pyramimonas*.** *Diss. Abstr. Int. B* 36(4): 1525-1526; 1976.

Growth curves were developed for the clones 1 and 13-10 of *Pyramimonas* and the incorporation of CO_2 into the cells of a culture was used as a measure of the photosynthetic capacity of the system. The rate of incorporation of CO_2 was diminished by the addition of 200 ppb DDT during the lag phase of growth but was unaffected by DDT in the exponential phase of growth. DDT even had a temporary stimulatory effect when added early in the exponential phase. After inoculation in a standard F/2 medium *Pyramimonas* 1 grew immediately in a geometric fashion without a lag phase and did not appear to be sensitive to DDT in routine sensitivity assays. *Pyramimonas* 13-10 on the contrary exhibited a lag phase in the same medium and is sensitive to DDT. To establish the sensitivity of *Pyramimonas* 1 it was necessary to promote a lag phase. Even with the use of small inocula or inocula taken from a late plateau phase, this did not appear. The trace metal chemistry of the medium was then modified. After removal of EDTA, reduction of iron and increase in copper concentration, a lag phase was observed together with inhibition by DDT. The physiological state of the cells in the lag phase and in the exponential phase are discussed with regard to their sensitivity to DDT and the chemistry of the medium. The possible synergistic effect of other pesticides and trace metals in highly polluted areas is elucidated. (Author abstract by permission. Copies of the thesis are available from University Microfilms)

77-0392. See, C. L. (Virginia Polytech. Inst. and State Univ, Blacksburg, VA). **The effect of sublethal concentrations of selected toxicants on the negative phototactic response of *Dugesia tigrina*.** *Diss. Abstr. Int. B* 37(5): 2112; 1976.

Acute bioassays were conduted on the planarian, *Dugesia tigrina*, to determine the toxicity of zinc, nickel, cadmium, copper, chormium, diquat, and ABS. The order of toxicity from most toxic to least toxic was: copper cadmium nickel zinc ABS chromium diquat. From these LC50 values sublethal concentrations were arbitrarily chosen for use in the light response studies. After acclimation to total darkness, crawling speed away from a beam of light was measured in the controls and the experimentals at 24, 48, and 96 hours. There were significant differences between the lowest sublethal concentrations and the highest sublethal concentration used in these experiments. For zinc, cadmium, and chromium the crawling speeds were slowest in the lowest concentration used. Under nickel, copper, diquat, and ABS stress, the slowest crawling speeds were found in the highest sublethal concentration used. This suggests that different systems in the animal's body were affected by the toxicants. It appears that sublethal concentrations of these toxicants have a marked effect on the negative phototactic response a *D. tigrina* as measured by the crawling speed away from a beam of light. (Author abstract by permission. Copies of the thesis are available from University Microfilms.)

77-0393. Breaud, T. P. (Louisiana State Univ. and A & M College, Baton Rouge, LA). **Effects of the insect growth regulator methoprene on natural populations of non-target aquatic organisms in Louisiana intermediate marsh habitats.** *Diss. Abstr. Int. B* 37(6): 2651-2652; 1976.

An overall method for sampling the marsh ecosystem and for determining the effects of an insecticide on non-target aquatic organism populations was developed and evaluated. The experimental design employed was very efficient; intense (580) sampling over a long period of time allowed for the detection of very minute differences between treated and untreated populations of aquatic organisms. Methoprene applied at rates recommended for mosquito control caused statistically significant differences in certain non-target populations when treated and untreated population were compared. Six aerial applications of methoprene over an 18 month period significantly reduced 12 non-target populations. Populations of four non-target aquatic organisms were signficantly increased after exposure to the methoprene treatments. Other aquatic non-target populations showed no significant ($P > 0.01$) differences when treated and untreated populations were compared. Methoprene seems to be harsher on members of non-target populations than has previously been reported; however, no information on the recovery of such populations after cessation of treatments was collected. A checklist of aquatic organisms occurring in a Louisiana intermediate marsh based on an 18 month sampling period has been established. In conjunction with the checklist, seasonal distribution data, habitat preference and relative abundance data of aquatic organisms on a Louisiana intermediate marsh has been established. The practicality and efficiency of the overall method used in this study has been demonstrated. The information supplied by this study forms a base for future investigations of a similar nature. This information allows future workers to determine when the aquatic populations are present, the abundance of them, and the number of samples needed to detect a given LSD. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 76-28,791).

77-0394. Shannon, V. C. (Iowa State Univ., Ames, IA). **The effects of mirex on the reproductive performance and**

behavioral development of the prairie vole *Microtus ochrogaster*. *Diss. Abstr. Int. B* 37(6): 2713-2714; 1976.

The effects of mirex (dodecachlorooctahydro -1,3,4- metheno-2H cyclobuta [*cd*]-pentalene) in *Microtus ochrogaster* were evaluated in three separate studies: 1) single generation, 90-day exposure reproductive study, 2) single generation, continuous-exposure reproductive study, and 3) multigeneration, continuous-exposure, reproductive and behavioral development study. In all studies, the following reproductive parameters were examined: adult mortality, percentage of mated pairs producing litters each generation, number of days from pairing of male and female to the birth of successive litters, number of days between consecutive litters, number of offspring per litter, mean number of litters per group, mean number of offspring per group, percentage of pups surviving to days 4 and 21, lactation index, and percent mortality of pups. In study 1, mirex levels of 1, 5, 10, 15, and 25 ppm in the diet resulted in a decrease in the reproductive performance in all parameters with the exception of number of offspring produced per litter and the percentage of pups surviving to day 4. In Study 2, mirex levels of 0.1, 0.5, 0.7, 1, and 5 ppm in the diet resulted in a decrease in the reproductive performance in all parameters with the exception of the number of days between consecutive litters and the mean number of offspring produced per litter. In Study 3, mirex levels of 0.1 and 0.5 ppm reduced reproductive performance in pups of the 1st and 2nd generations but not in dams. Thus, Studies 2 and 3 indicate that *M. ochrogaster* pups are extremely sensitive to low levels of mirex in the diet. Mirex residues found in the 90-day study indicated that this insecticide is persistent and is eliminated slowly from the animal. The single generation, continuous-exposure study indicated that mirex exposure for a 5-month period resulted in extensive accumulation and concentration of the insecticide over that of the level in the diet. The multigeneration study did not show a pattern of cumulative effects through the generations. In all studies, increased levels of mirex in the diet produced a corresponding increase in mirex residues in whole-body tissue. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 76-28,256).

77-0395. Campbell, K. L. (Univ. Michigan, Ann Arbor, MI). **The effects of neonatal treatment with *o,p'*-DDT on the development of the steroidogenic endocrine system in the male rat.** *Diss. Abstr. Int. B.* 37(6): 2739; 1976.

A precocious development of the adrenal cortex and altered serum LH responses to adult castration or repeated injection of LHRH were observed in male rats treated with *o,p'*-DDT less than 5 days after birth. The dynamics of the passage of *o,p'*-DDT from an injected female to a suckling pup, and an analysis of the fluctuation over 24 hours of intact male LH in response to diethyl ether were worked out. A FORTRAN program capable of combining mass values generated by gas chromatography with radioactivity counts for doubly labeled tritium and carbon-14 compounds, and an improvement in the assay of serum corticosterone are reported. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms.)

77-0396. Fulfs, J. C. (Albany Med. Coll. Union Univ., Albany, NY). **Hepatocellular responses and species variation to organochlorine compounds.** *Diss. Abstr. Int. B* 37(6): 2751; 1976.

Centrilobular hypertrophy and focal necrosis were both time and dose-related in mice fed 1, 5, 15 and 30 ppm mirex for up to 18 months; minimal centrilobular hypertrophy was found in rats given 30 ppm for 12 months, and there were no changes in monkey livers after 26 months at 20 ppm in the diet. After 7 days, mice given 25 mg/kg Aroclor 1254 had minimal centrilobular hypertrophy, mice given 4.5 mg/kg mirex had extensive centrilobular hypertrophy, and mice given 4.5 mg/kg mirex and 25 mg/kg Aroclor had minimal centrilobular hypertrophy with a centrilobular hyperplasia which distorted the normal liver cord arrangement, as well as large PAS positive, acid phosphatase-active vacuoles containing S.E.R., R.E.R., and mitochondria observed in centrilobular hepatocytes, sinusoids, and bile canaliculi. Porphyrin granules associated with lysosomes were found in centrilobular hepatocytes of mice given 25 mg/kg Aroclor 1221 or 25 mg/kg Aroclor with 1.5 mg/kg mirex; none appeared in a group given only mirex. In the group given both Aroclor and mirex, the porphyrins extended throughout the liver lobule. Application of chloroquine caused total reduction of porphyrin-laden lysosomes. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 76-27,414.)

77-0397. Szabo, I. N. (Dep. Clin., Uzhgorod Univ., USSR). **Chastichnaya gepatektomiya v usloviakh nositel'stva DDT. [Partial hepatectomy in DDT carriers.]** *Eksp. Khir. Anesteziol.* 5: 48-50; 1976. (4 references) (Russian)

Partial removal of the liver of experimental animals caused DDT to be released from fatty deposits. The toxic effect on the liver killed a percentage of the animals. The liver tissue of surviving animals showed morphological and functional changes; there were also changes in the immunological system.

77-0398. Shipp, E.; Otton, J. (Sch. Zool., Univ. New South Wales, Kensington, N. S. W., Australia). **Diel changes in DDT absorption and breakdown rates and respiratory rhythm in the housefly, *Musca domestica*.** *Entomol. Exp. Appl.* 19(3): 235-242; 1976. (16 references)

Three strains of flies given DDT at different hours of the day absorbed DDT at about the same rate regardless of the time of administration. The metabolic breakdown of DDT to DDE was most rapid when DDT was administered from 5:00 to 5:30 a.m. (with a minor peak at 3:00 p.m.), the

times of highest respiratory rate, and the rate of breakdown of DDT to DDE was different for the 3 species, in direct relation to the species-characteristic resistance to DDT poisoning. However, for all species, susceptibility to DDT was greatest between 5:00 and 5:30 a.m., the time of most rapid metabolic detoxification, and thus cannot be explained by these absorption and metabolic relationships.

77-0399. Benesova, O.; Hvizdosova, J.; Musil, J.; Kraus, M.; Erdosova, R. (Inst. Pharmacol., Med. Fac. Hyg., Charles Univ., Prague, Czechoslovakia). **Cholinesterase reactivators - contribution to the study of their metabolic effects.** *Experientia* 32(11): 1446-1447; 1976. (7 references)

Cholinesterase reactivators-trimedoxime, methoxime and obidoxime-injected in a dose of 20 mg/kg s.c., were found to increase muscle glycogen concentration in normal, but not in adrenalectomized rats. This effect may be in connection with a simultaneously found rise of serum corticosterone level. Trimedoxim decreased adrenaline, while methoxim and obidoxim noradrenaline concentration in adrenals. (Author abstract by permission)

77-0400. Korpachev, V. V.; Gordienko, V. M.; Oleinik, B. V. (Kiev Sci. Res. Inst. Endocrinol. Metab., Kiev, USSR). **Zavisimosti mezhdu nakopleniem *o,p'*-dikhlordifenildikhloretana v nadpochecknikakh, ikh funktsiei i strukturoi. [Relation between accumulation of *o,p'*-dichlordiphenyl- chloroethane in the adrenals, their function and structure.]** *Farmakol. Toksikol. (Moscow)* 39(3): 319-324; 1976. (18 references) (Russian)

Dogs were given 25 mg/kg body weight of *o,p'*-dichlorodiphenyl- dichloroethane (DDT) over a 28-day period. After 12 days, the compound was found to have accumulated in the adrenal tissue, and to have inhibited the function of the adrenal cortex. After 28 days, concentrations in the adrenals declined and function began to recover.

77-0401. Kondratyuk, V. A. (Dep. Pharmacol., Ternopol Med. Inst., USSR). **Vliyanie metafosa na zhelcheobrazovatel'nuyu funktsiyu pecheni. [The effect of metaphos on the cholopoietic function of the liver.]** *Farmakol. Toksikol. (Moscow)* 39(4): 470-474; 1976. (10 references) (Russian)

Albino male rats were fed metaphos (methyl parathion) either in single doses of one LD50, 1/10 LD50, or 1/20 LD50, or in daily doses over the course of one month. Bile secretion increased, the synthesis of primary bile acids and the conjugation of cholic acid with taurine and glycine decreased, and the conjugation and secretion of bilirubin increased.

77-0402. Zakirov, U. B.; Kadyrov, U. Z.; Mirtursunova, S. Z.; Gulyamov, T. D. (Dep. Pharmacol., Tashkent Med. Inst., USSR). **Ekzosekretornaya funktsiya podzheludochnoi zhelezy pro vozdestvii razlichnykh doz geksakhlortsiklogeksana. [Exosecretary function of the pancreas under the effect of different doses of hexachlorocyclohexane.]** *Farmakol. Toxikol. (Moscow)* (4): 455-458; 1976. (4 references) (Russian)

Hexachlorocyclohexane (BHC) administered to albino rats at 1/3 LD50 inhibited production of pancreatic amylase, lipase, and proteases. Doses of 1/20 and 1/50 LD50 produced initial inhibition, then stimulation of pancreatic exosecretory activity; there was an inverse relation between the size of the dose and the duration of the inhibition period.

77-0403. Buslovich, S. Yu.; Borushko, N. V. (Beloruss. Sanit.-Hyg. Inst., Minsk, USSR). **Khlorproizvodnye fenoksiuksusnoi kisloti kak antagonisty tireoidnykh gormonov. [Chloroderivatives of phenoxyacetic acid as antagonists of thyroid hormones.]** *Farmakol. Toksikol. (Moscow)* (4): 481-483; 1976. (6 references) (Russian)

Rana temporaria tadpoles were placed for 24 hours in solutions of the sodium and diethylamine salts of 2,4-dichlorophenoxyacetic acid (1 and 2 mg/l, respectively). Both conditions inhibited metamorphosis by interfering with the appropriate hormone. The sodium salt protected some tadpoles against lethal concentrations (1-5 mg/l) of thyroidin, and is thought to be an antagonist to the thyroid hormones.

77-0404. Voitenko, G. A.; Larinova, V. G. (Lab. Gen. Toxicol., All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, Plastics, Kiev, USSR). **O toksicheskom deistvii fosfamida pri odnovremennoi postuplenii v organizm cherez zhuludochno-kishechnyi trake i organy dykhaniya. [On the toxic effect of phosphamide with its simultaneous entrance into the organism through the gastro-intestinal tract and respiratory organs.]** *Farmakol. Toksikol. (Moscow)* 39(5): 39(5): 622-625; 1976. (8 references) (Russian)

Albino rats were administered phosphamide (dimethoate) by 2 different means simultaneously: 2 or 4 mg/kg gastrointestinally, and 0.95 or 1.9 mg/m^3 by respiration. Results were monitored over a 4-month period. The dual mode of administration appeared to increase toxic effect and anticholinesterase activity and produce greater changes in hematological indices; in addition, a higher level of the insecticide was found in biological substrates.

77-0405. Sauerhoff, M. W.; Heeschen, J. P.; Nyquist, R. A.; Braun, W. H. (Toxicol. Res. Lab., Health Environ. Res., Dow Chem. Co., Midland, MI). **Pharmacokinetic profile of diamidfos in rats.** *Food Cosmet. Toxicol.* 14(5): 401-408; 1976. (3 references)

Clearance of ^{14}C activity from plasma and elimina-

tion of ^{14}C from the body of rats were determined after administration of [^{14}C]Diamidfos in single iv doses of 1 and 25 mg/kg. Clearance of ^{14}C activity from plasma was by an apparent first order process with half-life values of 2.94 and 3.08 hr, respectively. Urinary elimination of ^{14}C activity from the body was biphasic at both dose levels. The half-life values for the rapid and slow phases of elimination were 3.08-3.47 and 10-11 hr, respectively, at both dose levels. Approximately 90% of administered ^{14}C activity was excreted in the urine and more than 95% of this was excreted during the first 36 hr. The ^{14}C activity eliminated in the urine consisted of three ^{14}C-labeled metabolites and [^{14}C]Diamidfos. Each metabolite and Diamidfos accounted for approximately 25% of the ^{14}C activity in the urine. The metabolites were identified by gas chromatography-mass spectrometry, infra-red spectroscopy and nuclear magnetic resonance spectrometry. The metabolites were *N*-methylphosphorodiamidate, *N*-formyl-*N'*- methylphosphorodiamidate and phenol. Approximately 7% of administered ^{14}C activity was eliminated in the feces. The only tissue with detectable amounts of ^{14}C activity was the liver, 72 hr after dosing. Overall recovery of ^{14}C activity was 97% of the calculated dose. Clearance of ^{14}C activity from plasma and elimination of ^{14}C from the body were determined also after a single oral dose of [^{14}C]Diamidfos at 25 mg/kg. The time profiles of plasma ^{14}C activity after administration of [^{14}C]Diamidfos at 25 mg/kg both iv and orally were directly superimposable. In addition, 87% of the ^{14}C activity was found in urine after oral administration. It appears, therefore, that orally administered [^{14}C]Diamidfos was extensively, if not completely, absorbed. There was no evidence of nonlinear pharmacokinetics and no indication that significant amounts of Diamidfos and/or its metabolites would be retained in the body over long periods of time or would accumulate on repeated administration. (Author abstract by permission)

77-0406. Danilov, A. F.; Sklyarov, A. I. (Sechenov Inst. Evol. Physiol. Biochem., Acad. Sci. USSR, Leningrad, USSR). **Vliyanie ingibitora kholinesteraz armina na funktsii nervno-myshechnogo sinapsa portyazhnoi myshtsy lyagushki. [The effect of armine on the frog sartorius nerve-muscle junction.]** *Fiziol. Zh. SSSR im. I.M. Sechenova* 42(9): 1310-1316; 1976. (17 references) (Russian)

Armine applied to frog muscle tissue in concentrations from 2×10^{-9} to 2×10^{-4} *M* prolonged post-junction potentials. Concentrations between 2×10^{-9} and 2×10^{-7} irreversibly increased the amplitude of miniature end-plate potentials. Armine from 2×10^{-6} to 2×10^{-4} *M* caused a decrease in the frequency of miniature end-plate potentials and the quantum content of end plate potentials (e. p. p. s.) (reversible after washing), thus indicating that armine in concentrations between 2×10^{-9} and 2×10^{-7} *M* exerts only an anticholinesterase effect. At the concentrations above 2×10^{-6} *M*, armine also affected presynaptic membranes and inhibited postsynaptic membrane choline receptors.

77-0407. Goncharuk, E. I.; Ukrainsky, V. V.; Tsipriyan, V. I.; Shevtsova, I. I. (Dep. Munic. Hyg., Kiev Med. Inst., Kiev, USSR). **Vliyanie polikhlorpinena na mikrofloru i biologicheskuyu aktivnost' pochvy. [The effect of polychloropinene on microorganisms and the biological activity of the soil.]** *Gig. Sanit.* (5): 54-57; 1976. (4 references) (Russian)

Polychloropinene was added to soil in concentrations of 1 and 10 mg/kg soil. There was a brief, temporary alteration of microorganism activity, measured by an increase of dehydrogenase and a decrease of protease.

77-0408. Tsapko, V. G. (Sci. Res. Inst. Indust. Hyg. Occup. Dis., Kiev, USSR). **K probleme kombinirovannogo destviya fosfororganicheskikh pestitsidov i shuma na organizm teplokrovnykh zhivotnykh. [The problem of combined action of organophosphorus pesticides and noise on the body of warm-blooded animals.]** *Gig. Sanit.* (5): 32-35; 1976. (5 references) (Russian)

Simultaneous exposure to maximum permissible concentrations of chlorophos (trichlorfon) and maximum permissible noise levels had a synergistic effect on indices of natural immunity and the activity of cholinesterase in blood and internal organs. This finding has significance in setting standards for occupational safety.

77-0409. Belyaeva, N. N.; Bystrova, T. A.; Revazova, Yu. A.; Arkhangelsky, V. I. (Dep. Gen. Hyg., I. M. Sechenov First Moscow Med. Inst., Moscow, USSR). **Sravnitel'naya otsenka toksicheskikh i mutagennykh svoistv organicheskikh soedinenii olova. [A comparative assessment of toxic and mutagenic properties of certain organic compounds of tin.]** *Gig. Sanit.* (5): 10-14; 1976. (7 references) (Russian)

Three organic tin compounds (bistributyltin oxide, monobutyltin oxide, monobutyltin trilaurate, tin dibutyl difluoroacetate) were tested for mutagenic activity. Fruit flies and mammalian bone marrow cells were studied after exposure to the compounds. The percentages of abnormal mammalian bone marrow anatelophases were 11.7% for bistributyltin oxide, 13.2% for monobutyltin trilaurate, and 6.2% for tin dibutyl ditrifluoroacetate, compared to 2.3% for controls. Chromatid gaps and unicentric fragments were the most prominent abnormalities.

77-0410. Korolev, A. A.; Arsenieva, M. V.; Vitvitskaya, T. A.; Kinzinrsky, A. S. (Dep. Commun. Hyg., I. M. Sechenov First Moscow Med. Inst., Moscow, USSR). **Eksperimental'nye dannye k gigienicheskomu normirovaniyu difenilamina i difenildietilmocheviny v vode vodoyemov. [Experimental data for hygienic standardization of diphenylan ne and diphenyldiethylurate in water bodies.]** *Gig. Sanit.* (5): 21-25; 1976. (8 references) (Russian)

Maximum permissible concentrations of

diphenylamine and diphenyldiethylaurate in water have been established at 0.5 and 0.05 mg/l, respectively. Experimental data indicate toxic effects on the central nervous system, liver, and blood that are typical of nitro-amine compounds. No allergic reactions or effects on reproduction have been observed.

77-0411. Suzuki, T.; Takeda, M. (Nat. Inst. Hyg. Sci., Tokyo, Japan). **Microbial metabolism of *N*-methylcarbamate insecticide. II. Synthesis of metabolites of *o-sec*-butylphenyl *N*-methylcarbamate.** *Chem. Pharm. Bull.* 24(9): 1976-1982; 1976. (11 references)

The known and expected metabolites of *o-sec*-butylphenyl *N*-methylcarbamate (BPMC) were synthesized. To clarify the configurations of the metabolites isomeric mixtures were prepared chemically, then separated by thin-layer chromatography. An unexpected reaction product was obtained, apparently due to carbomyl migration in acid medium. This type of migration may be characteristic of aromatic carbamate compounds which have a β—hydroxlated alkyl side chain in *ortho*-position.

77-0412. Wallace, M. E.; Knights, P.; Dye, A. O. (Dep. Genet., Cambridge, England). **Pilot study of the mutagenicity of DDT in mice.** *Environ. Pollut.* 11(3): 217-222; 1976. (11 references)

Mutagenicity of DDT was subjected to a preliminary examination by assessing the number of mutant individuals in an inbred strain of mice. Half of the animals had been fed a diet containing DDT at 250 ppm for five generations, and half were untreated. There was no excessive litter competition in the stock; the breeding program program used provided a fairly sensitive test. The incidence of recessive individuals was apparently no greater in the treatment group than in the control group according to available evidence; there were two recessive visibiles in the treatment group and none in the controls. Thus if any mutagenic effect of DDT exists it is not a gross one.

77-0413. Gupta, P. K.; Paul, B. S. (Indust. Toxicol. Res. Cent., Lucknow, India). **Bioavailability and metabolism of ^{32}P malathion in the hen.** *Environ. Res.* 12(3): 334-339; 1976. (14 references)

In this study separation of urine and feces was made possible in the hen and bioavailability and metabolism of [^{32}P] malathion were studied after a single oral dose of 262.4 mg/kg. The results suggested that the compound is absorbed fairly rapidly from the gastrointestinal tract, significant quantities being detected in plasma and blood after 30 minutes of ingestion. Highest concentrations were present during the 6 to 8 hours following oral administration. At 6 hours, the concentrations of ^{32}P was highest in liver followed by other organs. With the lapse of time the concentration in various organs decreased and at 48 hours, no ^{32}P was detected in heart, intestine, ovary, brain, adrenal, fat, muscle, and bone but traces (less than 5 μg/l g) were present in liver, kidney, lung, and spleen. The cumulative urinary and fecal excretion study revealed that the compound was rapidly metabolized and 90% was excreted within 24 hours indicating thereby that the compound is rapidly excreted and accumulation in the system is unlikely. (Author abstract by permission of Academic Press)

77-0414. Steinwandter, H. (Hessische Landwirtschaftl. Versuchanst., Darmstadt, Germany). **Zum Lindanmetabolismus an Pflanzen. II. Bildung von α-HCH. [Metabolism of lindane by plants. Part 2. Formation of α-BHC.]** *Chemosphere* 5(4): 221-225; 1976. (9 references) (German)

Formation of α-BHC from lindane in plants has been demonstrated for the first time, by gas chromatography and mass spectrometry. Following the six-month experimental period (using the same procedures and materials as in *Pesticides Abstracts* no.76-1978) the concentration of α-BHC reached a value of 0.046 ppm. Thus in addition to the quantities of α-BHC produced industrially, the agricultural application of lindane represents an important source of α-BHC contamination in the ecosphere.

77-0415. Wallnoefer, P.; Tillmanns, G.; Thomas, R.; Wunsche, C.; Kurz, J.; Jarczyk, H. J. (Bayerische Landesanst. Bodenkult. Pflanzenbau, D-8000 Munich, Germany). **Mikrobieller Abbau des Herbizids Methabenzthiazuron und Identifizierung der Metaboliten. [Microbial degradation of methabenzthiazuron and identification of the metabolites.]** *Chemosphere* 5(5): 377-382; 1976. (9 references) (German)

Urea herbicides are broken down in soil, primarily by microorganisms. Hydrolytic degradation to anilines has been described, as has *N*-demethylation, primarily performed by fungi from the species *Phycomycetales*. In plants methabenzthiazuron is primarily converted to 1-hydroxymethyl -3- (benzothiazole-2-yl)-urea, and glucose condensation products may also occur. The ability of the phycomycete Aunninghamella echinulata to degrade methabenzthiazuron was examined in culture solution. This organism has been shown to degrade phenylurea compounds. It also transformed methabenzthiazuron into two metabolites with maximum levels occurring after about 8 days of incubation. At the end of the experiment out of 400 μ/l methabenzthiazuron added intially the culture solution contained 181 μmol/l of unchanged starting material, 35 mol/l of 3-(benzothiazole-2-yl)-1-methylurea, and 82 mol/l of 3-(6-hydroxybenzothiazole-2-yl) -1,3- dimethylurea. The latter metabolite has also been demonstrated in mammal studies.

77-0416. Chambers, J. E.; Yarbrough, J. D. (Dep. Zool., Mississippi State Univ., University, MS 39762). **Xenobiotic biotransformation systems in fishes. (A review).** *Comp. Biochem. Physiol.* 55(2C): 77-84; 1976. (44 references)

Xenobiotic compounds are transformed in vertebrates to allow more rapid elimination in water-soluble form, especially through the mediation of hepatic microsomal systems. Fishes possess mixed-function oxidase systems, apparently of lower specific activity than comparable mammalian systems, and fishes are apparently also capable of conjugations with glucuronic acids and other ligands. Studies on mixed function oxidase and glucuronic acid conjugation systems in fish are reviewed. Metabolic activation of organophosphorus compounds has been observed in brook trout, brown trout, pumpkinseed, black bullhead, winter flounder, shorthorn sculpin, mosquitofish, golden shiner, green sunfish, and bluegill sunfish. Mixed function oxidase mediated dearylation of parathion and methyl parathion has been studied in mosquitofish, and metabolism contributed to resistance in exposed populations. Epoxidation of aldrin to dieldrin has been demonstrated in rainbow trout and other species. Mixed function oxidase induction by diet and other factors has been demonstrated in fish, though on a more limited scale than in mammals. Xenobiotic (e.g., organophosphate) reduction may also occur. Rainbow trout conjugated the lamprecide TFM, and mosquitofish converted aldrin to water-soluble metabolites which were probably conjugates.

77-0417. Graillot, C.; Gak, J. C.; Ferrando, R.; Truhaut, R. (Cent. Rech. Toxicol., Univ. Rene Descartes, Paris, France). **Induction du cytochrome P450 et vitamine A. Etude chez le porc sous l'influence du DDT.** [**Cytochrome P450 induction and vitamin A. Study in pigs under the influence of DDT.**] *C. R. Hebd. Acad. Sci. Ser. D* 282(16): 1561-1563; 1976. (9 references) (French)

Piglets receiving mixed diets supplying the recommended daily allowances of vitamin A and vitamin D3 were given technical DDT at 150 mg/kg mixed with the diet for 10 days. The pigs were then killed and the cytochrome P450 contents and the hepatic retinol reserve were determined individually for each liver lobe. DDT administration produced hepatic hypertrophy; the liver weight increased from ca. 1.7% to 2% of the body weight. Liver vitamin A levels decreased from ca. 750 IU/g to ca. 400 IU/g, and cytochrome P450 levels increased from ca. 33 nM/g to 153 nM/g in one experimental group and 80 nM/g in the other. The cytochrome P450 levels in both experimental and control animals varied from lobe to lobe of the liver, and the degree of induction in the individual lobes also varied.

77-0418. David, D.; Lutz-Ostertag, Y. (Lab. Biol. Anim., Univ. Clermont-Ferrand, Aubiere, France). **Effets du DDT sur plusiers generations de caille. Etude statistique des taux de mortalite, de fecondation, d'eclosion, de la pointe, du poids des oeufs et des poussins.** [**Effects of DDT on several generations of quail. Statistical study of mortality rate, fertility, hatching, and weights of eggs and chicks.**] *C. R. Hebd. Acad. Sci. Ser. D* 282(17): 1633-1636; 1976. (19 references) (French)

Eggs were treated with DDT by immersing in a solution of technical DDT at 5 g/l and the development of three generations of the chicks was observed, with or without additional DDT treatment of eggs from the intervening generations. The results were analyzed statistically. DDT treatment did not produce any significant reduction of fertility. Despite increased mortality among the controls in the third generation, the embryonic mortality in the succeeding generations after DDT treatment remained highly significant. Additional DDT treatment intensified this effect. The embryos generally died at the end of incubation or during hatching. The mortality rate of treated adult chickens differed only slightly overall from the controls. Hatching rate was reduced, corresponding to the increased mortality. The second and third generations of newly hatched chicks weighed significantly less than controls. A single DDT treatment had no effect on egg weight, while additional treatments of the first and second filial generations resulted in smaller eggs which were characterized by irregular and fragile shells. Egg laying in the filial generations was significantly retarded in the treated birds, but not in the offspring of the first treated generation without repeated exposure. The mean number of eggs laid was reduced only after two generations of DDT treatment.

77-0419. Meiniel, R. (Lab. Biol. Animale, Aubiere, France). **Teratogenese axial du parathion apres action de divers composes connus chez l'adulte ou l'embryon de vertebres pour posseder un pouvoir antitoxique ou antiteratogene apres des expositions aux phosphates organiques. Etude chez l'embryon de caille (*Coturnix coturnix* japonica).** [**Axial teratogenesis of parathion in quail embryos after exposure to compounds known to exert an antitoxic or antiteratogenic effect in adult or embryonic vertebrates following treatment with organophosphates.**] *C. R. Hebd. Acad. Sci. Ser. D* 283(9): 1085-1087; 1976. (19 references) (French)

Axial teratism is an effect that is highly specific for parathion. Freshly laid eggs were dipped in a parathion solution, then incubated for 3 days and injected with antidote solutions. Axial teratism was prevented by pralidoxime methylsulfonate, pralidoxime iodide, and obidoxime. Atropine, which combats the muscarinic effects of organophosphates, was ineffective, as were tryptophan and DMSO. The latter two compounds have displayed a certain protective effect in relation to morphogenetic disturbances induced by organophosphates. These findings aided in elucidating the characteristic parathion anomaly and the nature of the antiteratogenic action of the pyridine oximes.

77-0420. Bluzat, R.; Rodriguez-Ruiz, F. J.; Seuge, J. (Lab. Zool., Univ. Paris-Sud, Orsay, France). **Toxicite aigue de 5 agents polluants sur 4 especes d'invertebres habitant les eaux douces.** [**Acute toxicity of five pollutants to four freshwater invertebrate species.**] *C. R. Hebd. Acad. Sci. Ser. D* 283(9): 1089-1092; 1976. (12 references)

(French)

Two insecticides, a commercial herbicide comprising a mixture of 2,4-D and 2,4,5-T, a commercial laundry detergent, and sodium lauryl sulfate were examined for their effects on freshwater invertebrates. The four-day LC50 values for *Chaoborus* larvae were 0.19 ppm for carbaryl, 3.78 ppb for fenthion, 16.4 ppm for the herbicide, and 50 ppm for the two detergents. For *Cloeon* larvae the LC50 values were 0.34 ppm for carbaryl, 2.98 ppb for fenthion, 3.04 ppm for the herbicide, and 26.2 ppm for the commercial detergent. In *Gammarus* the values were 0.019 ppm for carbaryl, 9.77 ppb for fenthion, 2.28 ppm for the herbicide, 8.7 ppm for the detergent, and 14.4 ppm for sodium lauryl sulfate. For *Lymnea* the LC50 values were 8.67 ppm for carbaryl, 2.47 ppm for fenthion, 10.6 ppm for the herbicide, 20.3 ppm for the commercial detergent, and 24.4 ppm for sodium lauryl sulfate. Thus all of the compounds examined represent significant threats to aquatic organisms.

77-0421. Greaves, M. P.; Davies, H. A.; Marsh, J. A. P.; Wingfield, G. I. (Agric. Res. Counc., Weed Res. Organiz., Yarnton, Oxford, England). **Herbicides and soil microorganisms.** *Crit. Rev. Microbiol.* 5(1): 1-38; 1976. (208 references)

Findings regarding the effects of herbicides on soil microorganisms have proven contradictory to date. The inconsistencies have been caused to some extent by improper expression of herbicide concentrations and lack of knowledge of effective concentrations and biological properties of soil. However, no herbicide has yet been found which has a long-term harmful effect on the measured parameters of microbial activity when used at concentrations corresponding to normal agricultural usage. There is no evidence that recommended use of herbicides causes damage to the crop via the soil microflora except in uncommon instances where plant pathogens are stimulated. Techniques for detecting effects of herbicides on soil microorganisms should be improved and monitoring continued. There is a particular need for field experiments designed to demonstrate long-term effects of intensive herbicide usage.

77-0422. Iloba, C. (Crop. Sci. Dep., Univ. Nigeria, Nsukka, Nigeria). **Aspect of herbicidal effects on the ectosymbiotic microorganism of the forest plants.** *Eur. J. For. Pathol.* 5(1): 339-343; 1975. (13 references)

Laboratory experiments were performed to determine the effects of the herbicides amitrole and dalapon on the mycorrhizal fungi *Tricholoma saponaceum* (Fr.) Quel., *Tricholoma pessundatum* (Fr.) Quel. and *Amanita citrina* Schaefer in peptone broth. Amitrole had no effect on the fungi at 1 ppm; the dry weight of *T. saponaceum* was increased at 10 ppm and 100 ppm. At 1000 ppm amitrole inhibited mycelial growth of all the fungi. Growth of *T. saponaceum* and *A. citrina* was completely suppressed by amitrole at 1000 ppm, but *T. saponaceum* still produced 10% of the mycelial weight of the controls. Dalapon at 10 and 100 ppm significantly reduced the mycelia of *P. pessundatum*, insignificantly reduced that of *A. citrina*, and slightly increased that of *T. saponaceum*. All fungi were completely suppressed by dalapon at 10,000 ppm.

77-0423. Barham, S. S.; Brinkley, B. R. (Dep. Human Biol. Chem. Genet., Div. Cell Biol., Univ. Texas Med. Br., Galveston, TX 77550). **Action of rotenone and related respiratory inhibitors on mammalian cell division. 1. Cell kinetics and biochemical aspects.** *Cytobios* 15(58-59): 85-96; 1976. (23 references)

Delay or inhibition of mitosis in cultured mammalian cells has been reported following treatment with mitochondrial respiration inhibitors, phosphorylation inhibitors, and uncoupling agents. Although the molecular mechanism of mitosis retardation due to most respiratory inhibitors is presumed to involve a reduction to the supply of ATP needed for mitosis, a different mechanism was found to apply for rotenone. According to cell cycle kinetics studies, oxygen consumption measurements, and viscosity assays rotenone arrests cultured mammalian cells in mitosis by inhibiting spindle microtubule assembly by a mechanism similar to that of colchicine, colcemid and related antimitotic drugs. Amytal blocks electron transport at the same site blocked by rotenone but fails to arrest cell progression at mitosis. Rotenone delayed cell progression in all phases of the cell cycle, apparently as a direct result of respiration inhibition. The effect exerted by rotenone on events of the cell cycle appears to be a dual one.

77-0424. Barham, S.; Brinkley, B. R. (Dep. Human Biol. Chem. Genet., Div. Cell Biol., Univ. Texas Med. Br., Galveston, TX 77550). **Action of rotenone and related respiratory inhibitors on mammalian cell division. 2. Ultrastructural studies.** *Cytobios* 15(58-59): 97-109; 1976. (20 references)

Cultured mammalian cells were treated with rotenone (a respiratory inhibitor), then examined by light and electron microscopy. Chromosome, spindle, and centriole configurations were virtually identical to those in mitotic cells arrested with colcemid. Colcemid is known to inhibit microtubule assembly. Cells arrested in mitosis with either drug had their chromsomes grouped in a spherical mass near the cell center and the centrioles failed to migrate to the opposite mitotic poles. Limited numbers of spindle microtubules were observed near some chromosome kinetochores and the centrioles. No microtubules were observed in the outer portions of the cells' cytoplasm. The cells did not progress beyond early stages of mitosis in the presence of rotenone or colcemid, according to scanning and transmission electron microscopy. The ultrastructure of cells harvested from cultures grown in amytal was similar to that of untreated cells. Thus rotenone apparently arrests mitosis in mammalian cells by inhibiting spindle microtubule assembly.

77-0425. Amer, S. M.; Farah, O. R. (Lab. Genet. Cytol., Natl. Res. Cent., Dokki, Cairo, Egypt). **Cytological effects of pesticides. VIII. Effects of the carbamate pesticides "IPC", "Rogor", and "Duphar" on *Vicia faba*.** *Cytologia* 41(3/4): 587-606; 1976. (21 references)

Cytological effects of rogor (dimethoate), IPC (propham), and duphar (a mixture of propham and chlorpropham) were examined in two or three generations of *Vicia faba* plants. Spraying the bean plants with IPC at the flowering stage induced a relatively high precentage of abnormal PMCs. The most prominent effects of the pesticides were induction of multipolar AII and TII. In addition to other types of anomalies (stickiness, anaphase and telophase bridges, and lagging of chromosomes), IPC also induced tetraploid PMCs. The transmission of chromosomal aberrations to successive generations was low.

77-0426. Ranish, N. A.; Dettbarn, W. D. (Dep. Pharmacol., Vanderbilt Univ. Sch. Med., Nashville, TN 37232). **Effects of paraoxon on axoplasmic transport of cholinesterase in rat sciatic nerve.** *Exp. Neurol.* 53(3): 620-632; 1976. (33 references)

Paraoxon is an irreversible cholinesterase inhibitor which produces necrosis in innervated skeletal muscle. Fast axoplasmic protein transport has been suggested as a vehicle for maintaining normal muscle properties, and therefore it seems possible that this is involved in the muscle-damaging effect of paraoxon. The effects of paraoxon on cholinesterase activity and fast axoplasmic enzyme transport were examined by measuring the enzyme accumulation proximal to ligations of the rat sciatic nerve. In normal animals fast axoplasmic transport of a small amount of available enzyme was found to occur at approximately 400 mm/day. Paraoxon treatment significantly reduced the enzyme activity in muscle and nerve. Enzyme activity in muscle returns rapidly and continuously, while only a slight recovery is seen during the first 2 hr after treatment in nerve. This difference in recovery of enzyme activity suggests that axonal enzyme return occurs via somal synthesis and axoplasmic transport. It also appears that paraoxon does not alter fast axoplasmic transport of cholinesterase.

77-0427. Kupfer, D.; Bulger, W. H. (Worcester Found. Exp. Biol., Shrewsbury, MA). **Interactions of chlorinated hydrocarbons with steroid hormones.** *Fed. Proc., Fed. Am. Soc. Exp. Biol.* 35(14): 2603-2608; 1976. (56 references)

Effects of chlorinated hydrocarbons of the DDT class in mammals were examined. Two effects were considered: a) induction of hepatic mixed function oxidase (MFO), and b) estrogenic activities. The induction of MFO was discussed primarily with references to the enhancement of steroid hydroxylation. In turn, the increase in steroid hydroxylation by chlorinated hydrocarbons was usually accompanied by a decrease in the biological activity of endogenous and administered steroid hormones. The estrogenic activity of chlorinated hydrocarbons was found to reside primarily in the *o,p'*-DDT (a major contaminant of technical grade DDT). The mechanism of the estrogenic activity by DDT homologs was explored. It appears that *o,p'*-DDT acts like estradiol (F_2). Similarly to E_2, *o,p'*-DDT binds to the uterine cytosolic receptor. Furthermore, like E_2, *o,p'*-DDT is a potent inducer of certain uterine enzymes. For instance induction of ornithine decarboxylase of about 200-fold was observed with a high dose (250 mg/kg body wt.); however, as little as 5 mg/kg of *o,p'*-DDT exhibited marked induction of this enzyme—about threefold. The above activities of the chlorinated hydrocarbons were considered with respect to the potential long-term toxic effects which these compounds might elicit. (Author abstract by permission)

77-0428. Balazs, T. (Div. Drug Biol., Food and Drug Admin., Washington, D C). **Pathophysiologic significance of endocrine or metabolic effects of DDT in experimental animals.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 35(14): 2609; 1976. (11 references)

An estrogenic effect of *o,p'*-DDT elicited in rats fed 500 ppm in the diet was discovered in 1951. The induction of mixed-function hydroxylases in rats by 1 ppm DDT and the persistance of this effect during 3 months of treatment were demonstrated in 1965 and 1966. This effect may have physiologic significance, since steroid hydroxylases are also induced and thus the biologic half-life of the hormone in shortened (1969). An irreversible effect on the neuroendocrine differentiation of newborn female rats given *o,p'*-DDT in 20 mg subcutaneous doses was found in 1974. Two generations of rats fed a diet of 0, 20, or 200 ppm DDT from weaning unitl they had produced 2 litters did not display abnormal reproduction (1969); the progeny of groups of rats fed 200 and 500 ppm *p,p'*-DDT for 6 months of the breeding period showed deficient weight gain and survival, and the progeny of rats fed 1,000 ppm showed impaired neuroendocrine differentiation; some remained sterile and had cystic ovaries (1974). These studies reveal no evidence that a state of induction of mixed-function hydroxylases would have consequences for reproductive physiology. A decreased resistance in dogs dosed with *o,p'*-DDD (1970) can be explained in terms of a hormone deficiency that develops when the metabolic rate of a steroid increases but its production rate does not equal demand; *o,p'*-DDT was responsible for a similar effect on the production of cortisol in guinea pigs (1966). A decreased ACTH activity was found in dogs given 100 to 150 mg/kg of commercial DDT for a week (1969) (Author abstract by permission).

77-0429. Woolley, D. E. (Dep. Anim. Physiol. Dep. Environ. Toxicol., Univ. California, Davis, CA). **Some aspects of the neurophysiological basis of insecticide action.** *Fed. Proc., Fed. Am. Soc. Exp. Biol.* 35(14): 2610-2617; 1976. (18 references)

When the insecticide parathion was administered

to awake, unrestrained rats with chronically implanted brain electrodes, it was observed that the latency of the averaged flash-evoked potential in the visual cortex and superior colliculus was increased and the amplitude was decreased 2 to 4 hours later with responses returning the pretreatment levels about 8 hours after administration. Similarly, after administration of several dose levels of parathion in the rat, durations of phases of the maximal electroshock seizure (MES) pattern were altered to the greatest extent 4 hours later, but effects disappeared in 24 hours. These effects of parathion on the MES and evoked potentials coincided with a fall in blood and brain acetylcholinesterase (AChE) activities but disappeared after AChe inhibition had reached its peak and stabilized. Brain AChe activities required 2 to 4 weeks for recovery whereas blood AChe activity recovered in 1 week following inhibition by parathion (at least 2 mg/kg body weight). Studies in the monkey demonstrated similar results. Because these measurements of central nervous system function returned to normal despite continued inhibition of AChE activity, the results are interpreted to mean either that adaptation of evoked potentials or MES responses to prolonged AChE inhibition can occur in the rat and monkey after parathion administration or that some of the effects of parathion do not depend on AChE inhibition. Administration of DDT (100 mg/kg by mouth) to awake, unrestrained rats markedly increased the amplitude of spontaneous electrical activitity in the cerebellum, whereas there was much less effect on electrical activity recorded simultaneously in the occipital cortex, reticular formation, and medial geniculate body. Similarly, DDT administration had marked effects on the averaged, sound-evoked potential recorded in the cerebellum; DDT caused the appearance and increased the amplitude of an early component of this response not usually present during control recordings. Sound-evoked potentials recorded simultaneously from the frontal and occipital cortex and reticular formation were affected less or were decreased in amplitude by administration of DDT. (Author abstract by permission)

77-0430. Golberg, L. (Inst. Comp. Hum. Toxicol., Albany Med. Coll., Albany, N.Y.). **Pharmacological basis of pesticide toxicity.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 35(14): 2596-2597; 1976.

Pharmacological aspects of pesticides that have attracted current research include the alleged carcinogenicity of several organochlorine compounds; the reproductive effects of phenoxy herbicides; the possible mutagenicity of captan; individual and species differences in the metabolism of organophosphorus compounds; the chemical and biological implications of the photochemical transformations of pesticides; the physiological effects of organochlorine pesticides on steroid hormones; the neurophysiological basis of pesticide action; the epidemiology of organophosphorus and carbamate pesticides used on farms; and neurobehavioral abnormalities among workers exposed to organophosphorus pesticides. (Author abstract by permission)

77-0431. Singhal, R. L.; Kacew, S. (Dep. Pharmacol., Fac. Med., Ottawa Univ., Ottawa, Ontario, Canada. **The role of cyclic AMP in chlorinated hydrocarbon-induced toxicity.** *Fed. Proc., Fed. Am. Soc. Exp. Biol.* 35(14): 2618-2623; 1976. (54 references)

When either *p,p'*-DDT, α-chlordane, heptachlor or endrin was administered to male rats in small daily amounts over a prolonged period or in a single oral dose, significant increases were noted in the activities of renal and hepatic pyruvate carboxylase, phosphoenolpyruvate carboxylkinase fructose 1,6-diphosphatase and glucose 6-phosphatase, as well as an elevation in blood and urinary glucose and serum urea and a depression of liver glycogen. In accordance with the criteria that are required to establish a role for this cyclic nucleotide in the mechanism of action of these pesticides on renal and hepatic tissue, exogenous cyclic AMP treatment also resulted in a rise in blood glucose and urea, depression of liver glycogen as well as stimulation in the quartet of various key gluconeogenic enzymes. Incubation of hepatic and renal slices obtained from *p,p'*-DDT-treated rats displayed a significantly greater capacity to biotransform [^{3}H]adenosine into cyclic AMP. Both the addition of *p,p'*-DDT in vitro and the administration of pesticide in vivo produced a significant rise in the activity of adenylate cyclase in kidney cortex and liver. Whereas phoshodiesterase activity was not markedly altered by *p,p'*-DDT, the endogenous levels of renal and hepatic cyclic AMP were increased significantly in pesticide-treated animals. Although the activity of soluble cyclic AMP-independent protein kinase was not altered in *p,p'*-DDT-treated animals, a significant decrease was noted in the cyclic nucleotide-dependent form of this hepatic enzyme. Stimulation of this soluble enzyme was associated with a significant decrease in the cyclic AMP-binding capacity of the holoenzyme as well as elevation in the kinase activity ratio. Whereas addition of cyclic AMP failed to increase the phosphorylation of endogenous proteins in crude nuclear preparations, pesticide treatment significantly elevated the incorporation of ^{32}P into these substrates. In constrast, cyclic AMP-binding capacity of the nuclear enzyme was significantly decreased in livers of *p,p'*-DDT-injected rats. Cyclodiene insecticides such as α-chlordane, heptachlor and endrin also proved equally effective in raising the levels of endogenous cyclic AMP and augmenting the activity of hepatic and renal adenylate cyclase. Treatment with a methylated xanthine potentiated the effects of a submaximal dose of *p,p'*-DDT on blood glucose and urea, renal and hepatic gluconeogenic enzymes as well as the capacity of kidney slices to synthesize cyclic AMP from [^{3}H]adenosine. In constrast, whereas imidazole, propranolol and hydrazine prevented the insecticide-stimulated rise in cyclic nucleotide production, prostaglandin E_1 or F_{2a} failed to exert any significant effect on the *p,p'*-DDT-stimulated enhancement of cyclic [^{3}H]AMP formation from tritiated adenosine. Our data support the hypothesis that the *p,p'*-DDT and related organochlorine pesticide-induced alterations in glucose homeostasis are related to an initial stimulation of the cyclic AMP-

adenylate cyclase system in liver and kidney cortex. (Author abstract by permission)

77-0432. Menn, J. J.; DeBaun, J. R.; McBain, B. J. (Biochem. Dep., Stauffer Chem. Co., Mountain View Res. Cent. Mountain View, CA). **Recent advances in the metabolism of organophosphorus insecticides.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 35(14): 2598-2602; 1976. (23 references)

Rat metabolism studies were conducted with three organophosphorus ester insecticides [phenyl- or ethoxy-^{14}C]Dyfonate, *O*-ethyl *S*-phenyl ethylphosphonodithioate; [phenyl- ^{14}C]Trithion, *S*-[(4-chlorophenylthio) methyl] *O,O*- diethyl phosphorodithioate; and [phenyl-^{14}C]R-14805, 5-[(*O,O*-diethyl phosphorothioyl)]- acetophenoneoxime-*N'*-methylcarbamate. Compounds were administered orally to rats at 2 to 8 mg/kg, and biotransformation pathways were established from identified metabolites. Metabolites were isolated from 0-96 hr urine and identified by using one or more methods including thin-layer chromatography, radio-gas-liquid chromatography, mass spectrometry, and nuclear magnetic resoance. Each of these model insecticides displayed a distinct bioactivation and detoxification pathway. Conversion to potent acetylcholinesterase inhibitors resulted from desulfuration of Dyfonate, desulfuration and thioether oxidation of Trithion, and desulfuration and a variety of modifications of the leaving group of R-14805. The compounds were deactivated primarily via cleavage of an organophosphorus ester group. All three compounds and their metabolites were rapidly excreted primarily in urine without any bioaccumulation in tissues. (Author abstract by permission)

77-0433. Hasslinger, M. A.; Jonas, D. (Zool. Parasitol. Inst., Ludwig-Maximilians Univ., Munich, Germany). **Zur gebietsmaessigen therapeutischen Beeinfluessung des Magendasselbefalles bei Pferden. [Regionally adjusted treatment of *Gastrophilus* infestation in horses.]** *Fortschr. Vet. Med.* 20: 265-266; 1974. (German)

Dichlorvos (trade name Equigard), applied three times at intervals of about 4 weeks beginning in mid-December, was highly successful in eliminating parasitization of horses by botflies in Bavaria. Signs of infestation had practically disappeared after three years of treatment. Systematic applicatic· of the three-year treatment program has promise for complete elimination of botflies on a regional basis. Equigard is especially useful because of its low toxicity and the fact that it is effective against dipteran larvae as well as true helminths.

77-0434. Konstantinova, T. K. (Inst. Agric. Hyg., Saratov, USSR). **Vliyanie gerbitsida butilovogo efira 2,4,5-T na embriogenez belykh krys pri vozdeistvii v razlichnye periody beremennosti. [The effect of the herbicide 2,4,5-T butyl ether on the embryogenesis of albino rats treated at different periods of gestation.]** *Gig. Tr. Prof. Zabol.* 8: 15-19; 1976. (15 references) (Russian)

Pregnant albino rats were fed 0.1 mg/kg body weight 2,4,5-T butyl ether during different phases of the gestation period. Both the mother and embryo showed a general toxic response over the whole course of gestation, from the first to the twenth day. Exposure from the seventh to the fourteen day created the greatest predisposition to embryonic hemorrhage and urogenital defects.

77-0435. Daidkarimov, S. K.; Khalikov, T. R. (Inst. Advance. Med., Tashkent, USSR). **Issledovanie sostoyaniya uglevodno-fosfornogo obmena v serdechnoi myshtse pri khronicheksko intoksikatsii smes'yu pestitsidov. [Studies of the conditions of carbohydrate and phosphate metabolism in heart muscle following chronic intoxication with pesticide mixtures.]** *Gig. Tr. Prof. Zabol.* 8: 53-55; 1976. (11 references) (Russian)

Rats were given a mixture of lindane and phosphamide (dimethoate) in cotton seed oil by stomach tube at 1/20 LD50 per day for three months. On the day after pesticide administration was stopped the rats were killed and the following biochemical determinations were performed on myocardium of the treated animals: glycogen, lactic and pyruvic acids, inorganic phosphorus, ATP, hexokinase activity, glucose-6-phosphatase activity, phosphorylase activity, lactate dehydrogenase activity, and glycolysis rate. The ATP levels were found to be decreased, as was glycogen, corresponding to depressed phosphorylase and increased hexokinase activity. The glycolysis rate remained unchanged. Chronic intoxication with lindane and phosphamide was also accompanied by sharp increases in blood lactate, with a decrease in pyruvate and stable glucose levels.

See also 77-0235 77-0317 77-0462

77-0436. Vioque, A.; Albi, T. (Inst. Grasa Deriv., Seville, Spain). **Sobre la determinacion de residuos de insecticides clorados en aceitunas.** [**Determination of organochlorine pesticides residues in olives.**] *Grasas Aceite (Seville)* 27(1): 19-25; 1976. (10 references) (Spanish)

A number of solvent and adsorbent systems were examined for column chromatographic cleanup of the extracts of olive oil and olives prior to gas-liquid chromatographic pesticide analysis. Hexane-dimethylformamide partitioning was selected, and the extract was passed over an alumina column. This combination of solvent and adsorbent comprises the basis of the method of Noren and Westoo which is commonly used for determining pesticides in meat, eggs and fish. After the method was selected a special series of experiments was run with olives to assess its sensitivity and precision. The confirmatory tests selected comprised thin-layer chromatography. Recovery ranged from 69% for aldrin to 108% for heptachlor epoxide and endrin, and detection limits ranged from 0.008 ppm for lindane to 0.038 ppm for *p,p'*-DDT.

77-0437. Mestres, R.; Chevallier, C.; Pagnon, M. (Lab. Chim. Appl. Expert., Fac. Pharm. Montpellier, Montpellier, France). **Confirmation par spectrometrie de masse de l'identite et des teneurs en residus de pesticides et de diphenyles chlores dans les sediments du plateau continental languedocien.** [**Mass spectrometric confirmation of identity and residue levels of pesticides and polychlorinated biphenyls in sediments of the Languedoc contintental shelf.**] *Trav. Soc. Pharm. Montpellier* 36(2): 151-160; 1976. (1 reference) (French)

The determination of apparent triallate residues illustrates the great risk of error in qualitative detection of low levels of compounds in the absence of a systematic, very large assemblage of physical and chemical properties. However, fragmentographic analysis such as that employed here made it quite apparent that pesticides generally appear in pairs of interrelated peaks: *o,p'*- and *p,p'*-DDT appear together, *o,p'* and *p,p'*-DDE, and heptachlor and heptachlor epoxide, aldrin and dieldrin. This analysis, applied to concentration levels of less than hundredths of mg per kg, made it possible to reduce the portion due to BHC in the organochlorine residues detected and readily confirmed the existence of large quantities of DPC. It was also demonstrated that analysis of pesticide residues by the standard methods permits identification and correct determination, as long as the necessary cleanup and recovery are performed.

77-0438. Jensen, S.; Jansson, B. (Wallenberg Lab., Univ. Stockholm, Stockholm, Sweden). **Anthropogenic substances in seal from the Baltic: methyl sulfone metabolites of PCB and DDE.** *Ambio* 5(5-6): 257-260; 1976. (21 references)

Baltic seal species are apparently among the animals threatened by environmental pollutants. A large number of anthropogenic substances were isolated from seal blubber using a new cleanup procedure. Seal blubber was extracted and the solvent evaporated. The first cleanup step, intended to extract 99% of substances with lipophilicities similar to DDE and PCB and only 1% of the fat was accomplished using a procedure similar to the common acetonitrile/hexane partitioning, except that the fat itself served as the non-polar phase. At room temperature some fat was still soluble in acetonitrile but stepwise cooling to -16°C separated out additional fat. The sample was then chromatographed on a silica gel column with either (10%) in hexane as the mobile phase. The first 150 ml of eluant contained all PCB, DDT, and DDE, the second 320 ml contained compounds with GC retention times in the PCB region, and a further 2200 ml contained substances with GC retention times longer than those of PCBs. To confirm that the latter substances were the methyl sulfone metabolites of DDE and PCB, the third fraction was further cleaned up with alkali and sulfuric acid. The concentration of DDE sulfone in seal blubber was estimated as 4 ppm and total PCB sulfones as 16 ppm. The seal blubber also contained 150 ppm of total PCB, 138 ppm DDE, 10 ppm DDD, and 78 ppm DDT.

77-0439. Turner, B. C.; Glotfelty, D. E. (Agric. Chem. Manage. Lab., Agric. Res. Serv., Beltsville, MD 20705). **Field air sampling of pesticide vapors with polyurethane foam.** *Anal. Chem. (London)* 49(1): 7-10; 1977. (16 references)

Porous polyurethane foam plugs were tested for the adsorption of air-borne pesticide vapors. The pesticide vapor pressure and the time required for the air to flow through the plug pores were of determining significance for the trapping efficiency. The plug size and shape can be optimized for any chosen sampling rate with the aid of data presented. The quantitative limit is about 0.1 ng/m^3 in a 5 m^3 air sample. The porous polyurethane foam plugs have the advantages of flexibility in selection of flow rates, high efficiency and capacity of adsorption, ease of sample changing and storage, and convenient analytical extraction. A description is provided of an inexpensive portable unit that permits simultaneous collection of multiple samples at accurately determined elevations.

77-0440. Soulas, G. (Lab. Microbiol. Sol, Cen. Rech. Dijon, I.N.R.A., Dijon, France). **Utilisation de la technique de Stanford et Dement pour le dosage biologique des herbicides du sol.** [**Use of the method of Stanford and Dement for biological determination of herbicides in soil.**] *Ann. Agron.* 27(1): 101-109; 1976. (6 references) (French)

Two principal types of bioassays for herbicides are available, one based on the photosynthesis-inhibiting properties of herbicides in algae and the other measuring changes induced in the growth of higher plants. The Stanford and Dement method, used for examining soil-herbicide interactions, has now been adapted for herbicide bioassay in different soils. The tests plants are grown in pots placed on cotton mats connected by wicks to a con-

tainer of nutrient solution. Uniformly developed seven-day-old oat seedlings are transplanted to pots of soil or sand-soil mixture, with or without herbicide. Ten days after transplantation the test plants are harvested at soil level, dried, and weighed. Experiments conducted in this manner with atrazine at 0.5-2.5 ppm in soil gave a usable regression line with an approximately 13% error level. Dilution of the soil with sand resulted in a far steeper regression line. The bioassay method, while not offering the advantage of great accuracy, nevertheless offers certain methodologic advantages. The possibility of diluting the soil with sand means that soil effects on herbicide availability can be estimated.

77-0441. Toet, M. J.; Toet, L. (Tobacco Res. Bd. Rhodesia, Salisbury, Rhodesia). **Determination of chlorpyrifos (diethyl-3,5,6- trichloropyridyl phosphorothioate) in cured tobacco.** *Beitr. Tabakforsch.* 8(5): 334-338; 1976. (2 references)

A gas-liquid chromatographic method was developed for determining chlorpyrifos in cured tobacco; electron capture and thermionic detection were used. The ground cured tobacco is mixed with Florisil and Soxhlet extracted with acetone for 8 hr. The extract is evaporated to dryness, redissolved in a small amount of petroleum ether, and eluted through a silica gel column using first petroleum ether, then a 5% solution of ether in petroleum ether. Following adjustment of the eluate volume the chlorpyrifos present is determined by gas-liquid chromatography with an electron capture detector. A thermionic detector is used for confirmation. The thermionic detector gives no interfering peaks from tobacco coextractives, but samples must be concentrated ten times prior to injection. The lower limit of detection was 0.05 μg/g, and recoveries of 95-108% were obtained from spiked tobacco samples.

77-0442. Widdop, B. (Poisons Unit, Guy's Hospital, London SE1, England). **Detection of paraquat in urine.** *Brit. Med. J.* 2(6044): 1135; 1976.

A simple ward test has been made available for early detection of paraquat in urine, and the test reagents are now available in capsule form. Sodium hydroxide, formerly used as the alkalinizing agent prior to reduction to a blue radical ion with sodium dithionite, has been replaced by sodium biocarbonate and pH 9 buffer. Sodium bicarbonate alone did not suffice for some acidic urines. Gauge O gelatin capsules (1 g capacity) are filled from a well mixed combination of 10 g sodium dithionite, 6 g buffer powder, and 25 g sodium bicarbonate. The test is performed by breaking open the capsule, emptying the contents into 10 ml of urine, and shaking gently till dissolved. A green or blue color indicates the presence of paraquat, and the test may be made semiquantitative by preparing aqueous standard paraquat solutions. The capsules may be stored at room temperature for at least six months.

77-0443. Singmaster, J. A., III; Crosby, D. G. (Agr. Exp. Station, Univ. Puerto Rico, Rio Piedras, PR 00928). **Plasticizers as interferences in pollutant analyses.** *Bull. Environ. Contam. Toxicol.* 16(3): 291-300; 1976. (22 references)

Airborne compounds from two groups of plasticizers used in air conditioner filters and caulks as well as flexible polyvinyl chloride and related plastics have been identified as major sources of low level laboratory contamination that can cause serious interferences in pollutant analyses. Two compounds from the phthalic acid ester group (PAE) of plasticizers were found incorporated on air conditioner filters and as air fallout contaminants of clean and oil filmed dishes. Solvents, inorganic reagents, and hand-to-glass transfer contributed to sample contamination by PAE's. Several PAE's are detectable at 0.1 ng levels under some conditions of gas chromatography and have retention times on several columns that can interfere with analyses of chlorinated pollutants, especially *p,p'*-DDT. Aroclor 1254 was found in a caulk around a laboratory window. On oil filmed, but not clean dishes, the compounds collected from air fallout produced chromatograms closely corresponding to those of Aroclor 1242.

77-0444. Hattula, M. L.; Raisanen, S. (Dept. Chem., Univ. Jyvaskyla, Jyvaskyla, Finland). **Application of a new glass capillary chromatographic technique in the analysis of phenoxyacetic acid herbicides.** *Bull. Environ. Contam. Toxicol.* 16(3): 355-359; 1976. (9 references)

The degradation of MCPA, 2,4-D, and 2,4,5-T was studied at pH 5.5, 6.5, and 7.5 using a new high resolution glass capillary chromatographic technique. No statistically significant differences could be observed in the degradation of the three herbicides. The percent recoveries after 40 days were 30% at pH 5.5, 35% at pH 6.5, and 40% at pH 7.5. At 0°C and pH 7, none of the pesticides degraded after 8 mo. There was some degradation at pH 5 and 6 and the degradation rate was faster at room temperature. Using the high resolution glass capillary column, the methyl derivatives of the three herbicides could be detected by the FID detector. Similar gas chromatographic procedures can be used for the analysis of water samples, soil extracts, and biological materials contaminated by phenoxyacetic acid herbicides. No clean-up process is required.

77-0445. Comer, S. W.; Ruark, H. E.; Robbins, A. L. (Regional Pestic. Chem. Lab., P.O. Box 190, Wenatchee, WA 98891). **Stability of parathion metabolites in urine samples collected from poisoned individuals.** *Bull. Environ. Contam. Toxicol.* 16(5): 618-625; 1976. (2 references)

Serum cholinesterase values were correlated with *O,O*-diethylphosphorothioate (DETP), *O,O*-diethyl phosphate (DEP), and *p*-nitrophenol (PNP) levels in the urine of a child poisoned with parathion. Samples were collected initially, then on days 1-5 after administration of pralidoxime chloride. Portions of each sample were analyzed initially for each compound, and portions were

stored in a deep freeze for up to six weeks. Urinary parathion dropped from 4 to less than 1 ppm within the first day after medical treatment, while the DEP levels declined from 0.5 to 0.1 ppm. The concentration of PNP dropped from 3.8 ppm to below 1 ppm the day after treatment, then rose to 1.5 ppm on the second day and declined thereafter. The concentrations of DETP and DEP and in the samples collected on various dates declined during frozen storage. A sample initially containing 4 ppm DETP contained approximately half this amount after 4 wk of storage. Frozen storage will lead to inaccurate results in the case of exposure to pesticides that metabolize to DETP. The decrease in DETP concentration of a stock solution was almost as fast when the solution was kept in frozen storage as at room temperature.

77-0446. Zoraku, M.; Okura, Y. (Phys.-Chem. Lab., Nippon Kensa Co. Ltd., Tokyo, Japan). [**Simultaneous determination of four kinds of organophosphorus pesticides by gas chromatography.**] *Bunseki Kagaku (Jpn. Anal.)* 25(11): 790-794; 1976. (6 references) (Japanese)

A method of extraction, cleanup, and gas chromatographic determination of mixtures containing four organophosphorus pesticides, parathion, methyl parathion, EPN, and methyldemeton was devised. Specimens were extracted with *n*-hexane containing 10% chloroform. The extract was condensed, then injected onto a gas chromatograph with FPD detector to determine the 4 kinds of pesticides simultaneously. When the method was applied to 20 ml aqueous specimen, the lower limit of detection was 0.001 ppm or less. In cases of very impure materials such as bottom substances, industrial wastes, and factory effluent, the above-mentioned condensate was cleaned up by pouring over a column of activated Florisil and developing with *n*-hexane containing 2% acetone, then with a mixture of acetone and *n*-hexane (1:2). After dehydrating and condensing the cleaned up condensate was gas chromatographed. The recovery from fortified solid specimen weighing 10-20 g or 200 ml of factory effluent was 85-95% for parathion, methyl parathion and EPN, and 55-60% for methyl demeton.

77-0447. Bogacka, T. (Dep. Protect. Coastal Waters, Inst. Meteorol. Water Manage., Gdansk, Poland). **Kolorymetryczne oznaczanie mieszaniny herbicydow pochodnych kwasow aryloksyalkano-karboksylowych w wodzie.** [**Colorometric determination in water of pesticidal aryloxyalkenecarboxylic acid derivatives.**] *Chem. Anal. (Warsaw)* 20(2): 401-403; 1975. (6 references) (Polish)

Existing colorimetric methods for chlorophenoxy acids were adapted for simultaneous determination of 2,4-D, MCPA, dichlorprop, and mecoprop in water. The herbicide extracted from the water was cleaned up on thin-layer chromatoplates, and the spots corresponding to the locations indicated by the standards were scraped off and the herbicides eluted with ether. The herbicides were detected by the color reaction between chlorophenol and 4-aminoantipyrine in alkaline milieu. A five-hour hydrolysis step with acetic acid at 225-230°C was required for determination of mecoprop.

77-0448. Bessis, R.; Olivain, C. (Author address not given). **Essai de dosage biologique d'un herbicide.** [**Herbicide bioassay.**] *C. R. Seances Acad. Agric. Fr.* 60(12): 896-905; 1974. (8 references) (French)

A newly developed method for sterile test tube culture of seeds and cuttings makes it possible to determine very accurately the quantity of herbicide present by measuring plant growth. One herbicide, simazine, and four vegetable species were employed in a preliminary trial. The results of the study showed that the growth rate of young plants is mathematically related to the herbicide concentration present in the medium. The sensitivity of the plant species employed to the herbicide varied. The 0.5 ppm level of simazine in the growth medium best revealed the differences in plant sensitivity: it produced extensive growth suppression in colza and lilac, and only slight depression in the case of mustard and cress.

77-0449. Anonymous. **Automatische bepaling van pesticiden in voedsel.** [**Automated determination of pesticides in foods.**] *Chem. Tech. (Amsterdam)* 31(1): 24-25; 1976. (Dutch)

An apparatus has been developed for the automated, rapid determination of organochlorine compounds in foods. The pesticides are separated by liquid chromatography and determined with an electron capture detector. Its modular unit design makes it adaptable for a variety of analyses. The apparatus was tested for determining organochlorine compounds in milk, in which the pesticides concentrated in the lipid phase. For this analysis the apparatus was made up of four modules for sample workup, separation, detection, and fat assay. In the sample preparation module a hexane extract of the milk is prepared. In the separation module the hexane extract is separated into two fractions containing two groups of organochlorine compounds, which in turn are broken down and admitted to the analytical column or directly to the detector. The fat is washed from the precolumn with a polar solvent and determined by refractometry. The analytical results are processed and the system is controlled by means of a micro-computer. Advantages of this system include avoidance of volatiles losses due to elimination of solvent evaporation, the reduced analytical time due to the use of two columns, and the flexibility offered by the modular unit design.

77-0450. Anonymous. **Automatische bepaling van pesticiden in voedsel.** [**Automated determination of pesticides in foods.**] *Chem. Weekbl.* 46: 29-31; 1975. (Dutch)

This article duplicates the material in *Pesticides Abstracts* No. 77-0449, which see.

77-0451. Parlar, H.; Gaeb, S.; Michna, A.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen- Umweltforsch. mbH, D-8051 Attaching, Germany). **Beitraege zur oekologischen Chemie CXXIII. Darstellung niedrig chlorierter Bornanderivate als Vergleichssubstanzen fur die Strukturanalyse von Toxaphen-Komponenten. [Contributions to ecological chemistry part 123. Preparation of lower chlorinated bornane derivatives as reference substances for the structural analysis of toxaphene components.]** *Chemosphere* 5(4): 217-220; 1976. (9 references) (German)

Lower chlorinated bornane derivatives were prepared, not only as reference substances for the structural analysis of toxaphene components, but also for use as model substances in studies on ecological chemistry. The three previously known compounds 2-endo,6-endo-dichlorobornane, 2-exo-dichlorobornane, and 2-exo-10,10-trichlorobornane, were prepared along with the new compounds 2-exo-8,10-trichlorobornane, 2-exo-6-endo -10- trichlorobornane, and 2-endo,3-exo,5-exo, 6-endo-tetrachlorobornane. Gas chromatographic retention times relative to 2-endo-dichlorobornane, *Rf* values on prepared TLC plates, and ^{1}H-NMR and IR spectra were recorded.

77-0452. Gebefugi, I.; Parlar, H.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen Umweltforsch. mbH, D-8051 Attaching, Germany). **Beitraege zur oekologischen Chemie CXXVI. Kurze Mitteilung ueber die analytische Erfassung von Pentachlorphenol in geschlossenen Raeumen. [Contributions to ecological chemistry part 126. Brief communication on analytical detection of pentachlorophenol in closed rooms.]** *Chemosphere* 5(4): 227-230; 1976. (9 references) (German)

Reliable analytical methods for pentachlorophenol (PCP) are needed for quantitative assessment of environmental pollution by PCP. Experiments in this connection were performed in a room paneled with wood protected with a PCP-containing preservative. Air was sampled by drawing it through two gas wash bottles, each filled with 100 ml of 0.1 *M* potassium carbonate solution. The PCP collected was esterified with acetic anhydride to phenol acetate, then extracted with *n*-hexane and determined by gas chromatography. Room temperature and humidity affected the PCP levels determined in the test room, but other unexplained sources of variation were also present. The recorded PCP concentrations in the closed room varied from 1 to 160 $\mu g/m^3$.

77-0453. Ambrosetti, P.; Bolla, A.; Chiarlo, B. (Catt. Chim. R, Fac. Med., Univ. Genova, Genoa, Italy). **An emproved enzymatic reagent for visualization of phosphate esters in TLC.** *Chromatographia* 9(12): 633-634; 1976. (10 references)

A sensitive spray reagent for thin-layer chromatographic visualization of organophosphorus pesticides and other phosphate esters has been produced by deglobulinization and purification of horse serum. Spots are produced in areas where the phosphate esters inhibit the serum cholinesterase; they are clear and sharp edged against a dark background. The reagent can be prepared in bulk, is inexpensive, and can be stored at 4°C without deterioration for 6-12 mo.

77-0454. Katkar, H. N.; Barve, V. P. (Forensic Sci. Lab., Bombay-8, India). **A new spray reagent for the identification and determination of organophosphorus insecticides by thin layer chromatography.** *Curr. Sci.* 45(18): 662-664; 1976. (10 references)

In forensic toxicology the extraction of organophosphate pesticides from biological materials is always accompanied by coextraction of interfering substances; cleanup of the extracts is time-consuming and may result in losses of test substance. A new, specific reagent was developed for detection of organophosphorus pesticides on thin-layer chromatograms. The analytical method comprises activating a 1 mm silica gel layer for 1/2 hr at 110°C, developing with hexane-acetone (9:1), and then drying the plates. They are then sprayed with the new reagent, 0.5 g of mercuric nitrate dissolved in 100 ml of water, followed by 1 g of potassium ferrocyanide freshly dissolved in 100 ml of water. Bluish-green spots are observed after keeping the plate at room temperature for about 5 min. As little as 5 μg of compound could be detected in the case of parathion, methyl parathion, malathion, diazinon, dimethoate, fenitrothion, fenthion, and fensulfothion. The detection limit was 50 μg for Bayer 78411, dichlorvos, and phosphamidon, and 10 μg for methyl demeton. The color remained stable for several days.

77-0455. Schulte, E.; Thier, H. P.; Acker, L. (Inst. Lebensmittelchem., Univ. Muenster, Muenster, Germany). **Rueckstandsanalytik polychlorierter Biphenyle in Lebensmitteln tierischer Herkunft: Erfahrungen und Vorschlaege zur Vereinheitlichung. [Residue analysis of polychlorinated biphenyls in foods of animal origin and suggestions for standardization.]** *Dtsch. Lebensmittel-Rundsch.* 72(7): 229-232; 1976. (9 references) (German)

The method of Stijve has proven useful for cleaning up fatty foods of animal origin prior to analysis for polychlorinated biphenyl (PCB) residues. For the gas chromatographic separation on packed columns QF-1 or XE-60 should be used as the stationary phase, since this permits good separation of PCB from most chlorinated hydrocarbon pesticides. Fractioning of the cleaned-up extracts prior to GLC can be dispensed with in most cases. For quantitative evaluation of the chromatograms the selection of two characteristic peaks which remain in the food extracts is recommended. The procedures described should aid in standardization of PCB analysis and in comparison of results.

77-0456. Weber, R.; Zipfel, K. (Landesanst. Lebensmittel- Arzneim. Gerichtl. Chem., Berlin, Germany). **Zur**

Schnellbestimmung von chlorierten Kohlenwasserstoffen und Phosphorsaeurestern in pflanzlichen Lebensmitteln. [**Rapid determination of chlorinated hydrocarbons and organophosphates in foods of vegetable origin.**] *Dtsch. Lebensm. Rundsch.* 72(7): 236-239; 1976. (7 references) (German)

A rapid method is presented for determining organochlorine and organophosphate compounds in vegetable matter. The active ingredients are extracted with ethyl acetate, cleaned up on an activated carbon/silica gel column and eluted with a mixture of ethyl acetate, acetone, toluene, and water. This method eliminates the time-consuming partitioning steps, the use of chlorinated solvents which provide interference with the electron capture detector, and the use of benzene, which is debatable from the toxicologic viewpoint.

77-0457. Kroller, E. (Bundesgesundheitsamt, Max von Pettenkofer-Inst., Berlin-Dahlem, Germany). **Eine Moeglichkeit zur Restmengen-Bestimmung von Tricyclohexylzinn-Verbindungen.** [**Determination of residual quantities of tricyclohexyltin compounds.**] *Dtsch. Lebensm.-Rundsch.* 72(9): 312-313; 1976. (3 references) (German)

Tricyclohexyltin compounds are currently being used as acaricides and fungicides in agriculture. A method has been developed for determining residues of these compounds in and on plants. The tin compounds are extracted (Soxhlet) with methylene chloride, cleaned up by shaking with Komplexon (disodium EDTA) and Zephirol solutions, and treated with concentrated sulfuric acid. Then the solvent is extracted and the organic matter digested. The mineralized tin is then distilled off from the digested material as the tetrabromide. The Sn(IV) is determined by polarography or spectroscopy.

77-0458. Kozu, T.; Komazawa, S.; Konuma, S.; Wada, T. (Sci. Invest. Res. Lab., Nagano Prefect. Police Headquarters, Nagano, Japan). [**Determination of trichlorfon in blood by gas chromatography.**] *Eisei Kagaku (J. Hyg. Chem.)* 22(2): 91-93; 1976. (6 references) (Japanese)

Extraction, purification and determination of trichlorfon from blood were studied. In extraction, ethyl ether and ethyl acetate gave nearly the same recovery of trichlorfon from fortified blood results; however, ethyl ether was selected because of the rapidity of procedures after extraction. Recovery of trichlorfon from fortified blood was highest (94.3%) when one ml of buffer solution was added to 1 ml of blood containing various amounts of trichlorfon and after adding 0.6 g magnesium sulfate, then extracting with ether. The extract was purified by a silica gel column containing added 15% of purified water. Gas chromatography using a column of 25% Carbowax 20M with trimethyl phosphate as the internal standard could determine trichlorfon without being affected by interfering matter.

77-0459. Hashemy-Tonkabony, S. E.; Asadi Langaroodi, F. (Dep. Food Hyg., Vet. Fac., Univ. Tehran, Tehran, Israel). **Detection and determination of chlorinated pesticide residues in Caspian Sea fish by gas-liquid chromatography.** *Environ. Res.* 12(3): 275-280; 1976. (4 references)

Organochlorine pesticides have been used in the past for malaria control, and are still being applied agriculturally in the lands surrounding the Caspian Sea. Frozen fish specimens caught in the Caspian Sea were analyzed for organochlorine residues. Ground fish muscle is Soxhlet extracted with petroleum ether, the extract partitioned with acetonitrile, the solvent evaporated, and the extract cleaned up on a florisil column. Elution is performed with a 6% solution of ethyl ether in petroleum ether, then with 15% ethyl ether in petroleum ether. The 6% ethyl ether in petroleum ether eluate is concentrated to 10 ml, then made up to the analytical volume with petroleum ether. The 15% eluate is cleaned up on a MgO-celite 545 column. Then gas chromatography with an electron capture detector is employed. The DDE levels in various fish species ranged from 0.0047 to 0.0302 ppm; TDE, 0.0036 to 0.027 ppm; DDT, 0.0048 to 0.0546 ppm; lindane 0.0046 to 0.0542 ppm. Aldrin was found at 0.0143 ppm in common pike and 0.0053 ppm in common carp, heptachlor at 0.053 ppm in salmon and 0.0016 ppm in beluga, and dieldrin was detected in four species at 0.001-0.002 ppm. A total of 72 specimens of 14 species were analyzed.

77-0460. Ronzani, N.; Guillochon, D.; Lange, C.; Basselier, J. J. (Lab. Chim. Organ. Struct., Paris, France). **Mesure de l'activite des cholinesterases par spectroscopy. II. Dosage par spectroscopie IR et RMN du pouvoir anticholinesterasique de carbamates a activite insecticide.** [**Spectroscopic measurement of cholinesterase activity. II. IR and NMR spectroscopic determination of the anticholinesterase properties of insecticidal carbamates.**] *Eur. J. Med. Chem. Chim. Ther.* 11(4): 310-315; 1976. (12 references) (French)

A method for NMR and IR determination of the anticholinesterase properties of poorly water-soluble compounds is based on measurement of the initial rate of acetylcholine hydrolysis by serum pseudocholinesterase. The solvent selected was a mixture of water and dioxane (25%) for NMR and D_2O-dioxane (25%) for IR. Increased quantities of enzyme were used in this solvent mixture. Direct recording of the changes in optical density was employed to pinpoint the initial rapid hydrolysis period. The method was tested on compounds of known activity, phenol carbamates and carbaryl, then applied to unknowns with a variety of structures. The results provided by IR and NMR were basically equivalent. Structure-function studies were performed.

77-0461. Gras, G.; Pellissier, C.; Fauran, F. (Lab. Chim. Anal. Toxicol., Fac. Med. Pharm., Dakar, Senegal). **Toxicologie analytique du chloralose. Application dans 3 cas**

d'intoxication aigue. [Analytical toxicology of chloralose. Application in three acute intoxication cases.] *Eur. J. Toxicol.* 8(5): 371-377; 1975. (20 references) (French)

Urine specimens from three patients with acute chloralose poisoning (one suicidal, one accidental, one homicidal) were assayed by a method developed by the authors. In this method two aliquots of the urine are used, one for determination of free chloralose and the other for total chloralose. The total chloralose is determined after hydrolysis of the glucuronide by α-glucuronidase from *Helix pomatia*. Specimens are extracted by continuous liquid-liquid extraction with ether in acid milieu, preferably after prior removal of interfering compounds from the urine. The ether is then evaporated and the residue taken up in water, after which it is oxidized with periodic acid, the Fujiwara reaction is performed, then the Leibman and Hindman reaction. The attempted suicide victim ingested a rotenticide containing approximately 9 g of chloralose. She had excreted about 43% of the ingested dose of chloralose within the first 30 hr of hospitalization. The accidental poisoning victim apparently added half a packet of α-chloralose to his coffee in place of sugar, and thus consumed ca. 1.50 g of rodenticide. He excreted 664 mg of α-chloralose in the urine during the first 12 hr of hospitalization. In the third case the rodenticide was apparently criminally added to a jar of instant coffee. Estimation of the total dose ingested was difficult. Data from these cases indicates that about 45% of the ingested amount is excreted within the first 24 hr, 90% as the glucose conjugate.

77-0462. Stevens, H. M.; Moffatt, A. C.; Drayton, J. V. (Home Office Cent. Res. Establ., Aldermaston, England). **The recovery and identification of fluoroacetamide and fluoroacetic acid from tissues.** *Forensic Sci.* 8(2): 131-137; 1976. (9 references)

A method was developed for rapid extraction and GLC identification of fluoroacetamide from tissues. A mass spectrometer in the multiple ion monitoring mode was used as the gas chromatographic detector. Recoveries from spiked homogenized animal and human tissues were about 30-35% for fluoroacetamide and 50-55% for fluoroacetic acid. The minimum detectable levels in tissue were found to be about 0.7 μg/g for the amide and 0.1 μg/g for the acid. Guinea pigs fatally poisoned with these compounds had tissue levels of about 3 μg/g for fluoroacetamide and 2.5-10 μg/g for fluoroacetic acid.

77-0463. Ruohonen, A.; Korte, T.; Alha, A. R. (Dep. Forensic Med., Chem. Div., Univ. Helsinki, Helsinki, Finland). **Blood and brain acetylcholinesterase activity. Quantitation of anticholinesterase compounds by the cholinesterase inhibition method and gas chromatography.** *Forensic Sci.* 8(2): 195; 1976.

Acetylcholinesterase activity was estimated by the Ellman spectrophotometric DTNB method at pH and 25°C. Mean acetylcholinesterase levels of 8.3 μM/min/ml in blood and 9.6 μM/min/g in cerebellum were recorded in "normal" death cases. In cases of fatal cholinesterase inhibitor poisoning the mean values obtained were 1.8 μM/min/ml in blood and 1.5 μM/min/g in brain. Normal animal blood displayed considerably lower activity (1.7-3.0 μM/min/ml). Higher values were obtained for the brains of some small animals. Up to 65 μM/min/g was recorded for hen cerebellum. Experiments were conducted with the acetylcholinesterase inhibition method using hen cerebellum homogenate as the enzyme source for evaluating fatal cholinesterase inhibitor poisoning. Simultaneously gas chromatography was used for pesticide quantitation in fatal poisoning by propoxur, parathion, and mevinphos. The results corresponded closely for blood, urine, and stomach contents. The inhibition method was particularly sensitive for propoxur (detection limit ca. 0.1 g). (From abstracts of papers presented at the Sixth Scandinavian Meeting in Forensic Medicine, Helsinki, June 16-18, 1976.)

77-0464. Vogel, H.; Weeren, R. D. (C. H. Boehringer Sohn, D-6507 Ingelheim/Rhein, Germany). **Bestimmung von 2,3,7,8-Tetrachlorodibenzo- *p*-dioxin in 2,4,5-Trichlorphenoxyessigsaure. [Determination of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin in 2,4,5-trichlorophenoxyacetic acid.]** *Fresenius Z. Anal. Chem.*, 280(1): 9-13; 1976. (10 references) (German)

2,4,5-T is dissolved in dimethylformamide-acetonitrile-water, and extracted with hexane. The extract is purified by chromatography in a column of alumina, followed by thin-layer chromatography on silica gel. The quantitative determination of dioxin is achieved by gas-liquid chromatography on a column containing SE 30 with flame-ionization detection. Recovery of dioxin is about 95%, limit of detection about 0.03 ppm. The method of the dioxin panel was tested in two collaborative studies. (Author abstract by permission)

77-0465. Reichling, J.; (Inst. Pharm. Biol. Univ., Im Neuenheimer Feld 364, D-6900 Heidelberg, Germany). **Eignung von basischem Zinkcarbonat fuer die Pesticid-Rueckstandsanalytik. [Suitability of basic zinc carbonate for the analysis of pesticide residues.]** *Fresenius Z. Anal. Chem.* 281(2): 139-140; 1976. (4 references) (German)

Basic zinc carbonate is more suitable than silica gel in certain respects for thin layer chromatographic separation of pesticide groups. Its suitability for routine cleanup of pesticide extracts was examined using a mixture of bromophos, parathion, azinphosmethyl, and malathion. A fluorescent indicator was added to the adsorbent, and the pesticides were located on the TLC plate via their quenching of fluorescence. A dry zinc carbonate column was also prepared and petroleum ether pesticide extracts were cleaned up on this column. Carotene is a useful indicator substance, since it immediately precedes parathion on chromatograms of parathion-containing vegetable matter.

77-0466. Thielemann, H. (Halberstadt, DDR). **Zur Einwirkung von Natriumhydroxid auf einige Insecticide (chlorierte Kohlenwasserstoffe) im Hinblick auf die semiquantitative duennschicht-chromatographische Bestimmung von Gesamt-DDR (DDT + DDE) in der Milch** [**Effect of sodium hydroxide on some insecticides (chlorinated hydrocarbons) with regard to the semiquantitative TLC determination of total DDT (DDT + DDE) in milk.**] *Fresenius Z. Anal. Chem.* 281: 303-304; 1976. (German)

Alkaline hydrolysis is generally employed in the thin-layer chromatographic determination of DDT in milk. Other organochlorine compounds which are present may also be hydrolyzed and may be converted into compounds which could interfere in DDT analysis. Therefore the effects of sodium hydroxide at various concentrations on insecticides were examined. The *Rf* values are presented for DDT, DDE, aldrin, endrin, dieldrin, BHC, and methoxychlor following treatment of 20 ml milk with 0, 5, or 12 g of sodium hydroxide. As little as 0.03 to 0.04 μg of DDT was detectable on the thin-layer plate using an ammoniacal silver nitrate solution.

77-0467. Tewari, S. N.; Sharma, T. C. (Toxicol. Div., Chem. Examiner's Lab., Agra, India). **Detection and determination of γ-BHC in toxicological analysis by thin-layer chromatography.** *Fresenius Z. Anal. Chem.* 282(2): 143; 1976.

A suitable method was developed for determining g-BHC (lindane) in autopsy tissues. Macerated tissue is dried with sodium sulfate and refluxed three times with n-hexane. The extract is shaken three times with acetonitrile, then the acetonitrile extract is diluted with a 20-fold volume of water and reextracted twice with n-hexane and saturated sodium sulfate. The combined final extracts are evaporated to dryness. The residue is dissolved in acetone and spotted onto TLC plates prepared from nitric acid-silver nitrate treated silica gel. The plates are developed in the ascending mode with petroleum ether/liquid paraffin (90:10). The plate is irradiated for 10 min with UV light, then the black spots formed are compared to those obtained with a standard solution. The limit of detection was 0.1 μg, and a linear relation of quantity to spot size was obtained at 0.5-8 μg.

77-0468. Thielemann, H. (Halberstadt, DDR). **Duennschicht-Chromatographische Auftrennung und Identifizierung eines Gemisches von polychlorierten Biphenylen (PCB) und *p,p'*-DDE an paraffinimpraegnierten Kieselgur G-Schichten.** [**Separation and identification of a mixture of PCB and DDE by TLC on paraffin-impregnated Kieselguhr G layers.**] *Fresenius Z. Anal. Chem.* 282(2): 144; 1976. (German)

TLC determination of *p,p'*-DDE in the presence of PCB is difficult due to the existence of a PCB spot with the same *Rf* as *p,p'*-DDE. A new technique was developed to solve this problem and tested using Clophen A50, a chlorinated biphenyl mixture similar to that found in environmental specimens. Chromatographic layers were prepared by coating plates with a Kieselguhr G suspension, washing out the chlorine with acetone, and activating for 30 min at 110°C. The plates are immersed for 2 min in an 8% solution of liquid paraffin in petroleum ether, then dried in air. The prepared plates may be used immediately or stored for a long time before use. Satisfactory separation of the DDE spot from the PCB was achieved using acetonitrile/acetone/methanol/water (40:18:40:2) as the solvent (running time ca. 2 hr). The plates were dried, sprayed with ammoniacal silver nitrate, and illuminated with UV for 30 min.

77-0469. Konyukhov, A. F. (All-Union. Inst. Exp. Vet. Med., Moscow, USSR). **Opredelenie butifosa v moloke, krovi, i moche s pomoshch'yu tonkosloinoi khromatografii.** [**Determination of butyfos in milk, blood, and urine by thin-layer chromatography.**] *Gig. Sanit.* 41(5): 83-85; 1976. (2 references) (Russian)

Acetone was selected as the preferred extraction solvent for butyfos (DEF) from milk, blood, and urine. The DEF was separated from coextracted contaminants by shaking the aqueous product with n-hexane, then passing the extract over an alumina column. DEF was detected with bromophenol blue following thin layer chromatographic development with hexane/acetone (4:1). The limit of detection was 0.5 ppm.

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